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The AUTOMOBILE

Eleven French Makers Win War Department Subsidy

Completion of 2,200-Mile Truck Test Eliminates 50 Per Cent. from Army Favor—High Speeds Eliminate Steel-Shod Trucks—Hill-Climbing Feature To Test Clutch and Gear Ratio—Standardization Features Demanded

By W. F. Bradley

PARIS, Aug. 29.—Six weeks ago, 72 trucks started in the French army trials. Sixty-eight of them returned to headquarters after covering 2,200 miles on varied roads, and after a close technical examination thirty-eight models have been recognized perfect.

These thirty-eight machines represent nineteen distinct models, each firm having the right to enter two units per class, which can be sold to the general user as army subsidy types. Purchasers of these types can claim the army subsidy by keeping their trucks in good running condition and guaranteeing to turn them over to the army in time of mobilization. The successful firms in the trials are:

Delahaye, four models; Latil, two models; Berliet, four models; Saurer, two models; and Panhard-Levassor, De Dion Bouton, Delaugere-Clayette, Brasier, La Buire, Peugeot and Aries, one model each.

The firms having failed to qualify in the trials are Renault, Balachowsky & Caire, Rochet-Schneider, Motobloc, Clement-Bayard, Lorraine-Dietrich, and Cohendet.

In addition to these failures, the following firms figuring on the honors list were not successful in getting all their vehicles passed for acceptance:

Latil, one model eliminated.

De Dion Bouton, two eliminated.

Delaugere-Clayette, one model eliminated.

Saurer, one model eliminated.

Peugeot, three models eliminated.

Aries, two models eliminated.

As the result of these trials the army authorities decided that the following makes of rubber tires could be fitted to army trucks: Gaulois (which were used on 78 per cent. of the trucks tested), Continental, Hutchinson, Goodrich, Lutetia, Dunlop and Grammont.

With more than 47 per cent. failures, it is evident either that the trucks were of poor quality or the competition was exceptionally severe. It was the latter condition which prevailed. With the growing popularity of the subsidy system, and the improvements that have been made in design and construction, it has become possible for the army authorities to raise their standard. They have not failed to do this. The distance on the road was increased; the average speed was put up from 7.4 to 9.3 miles an hour with the ob-

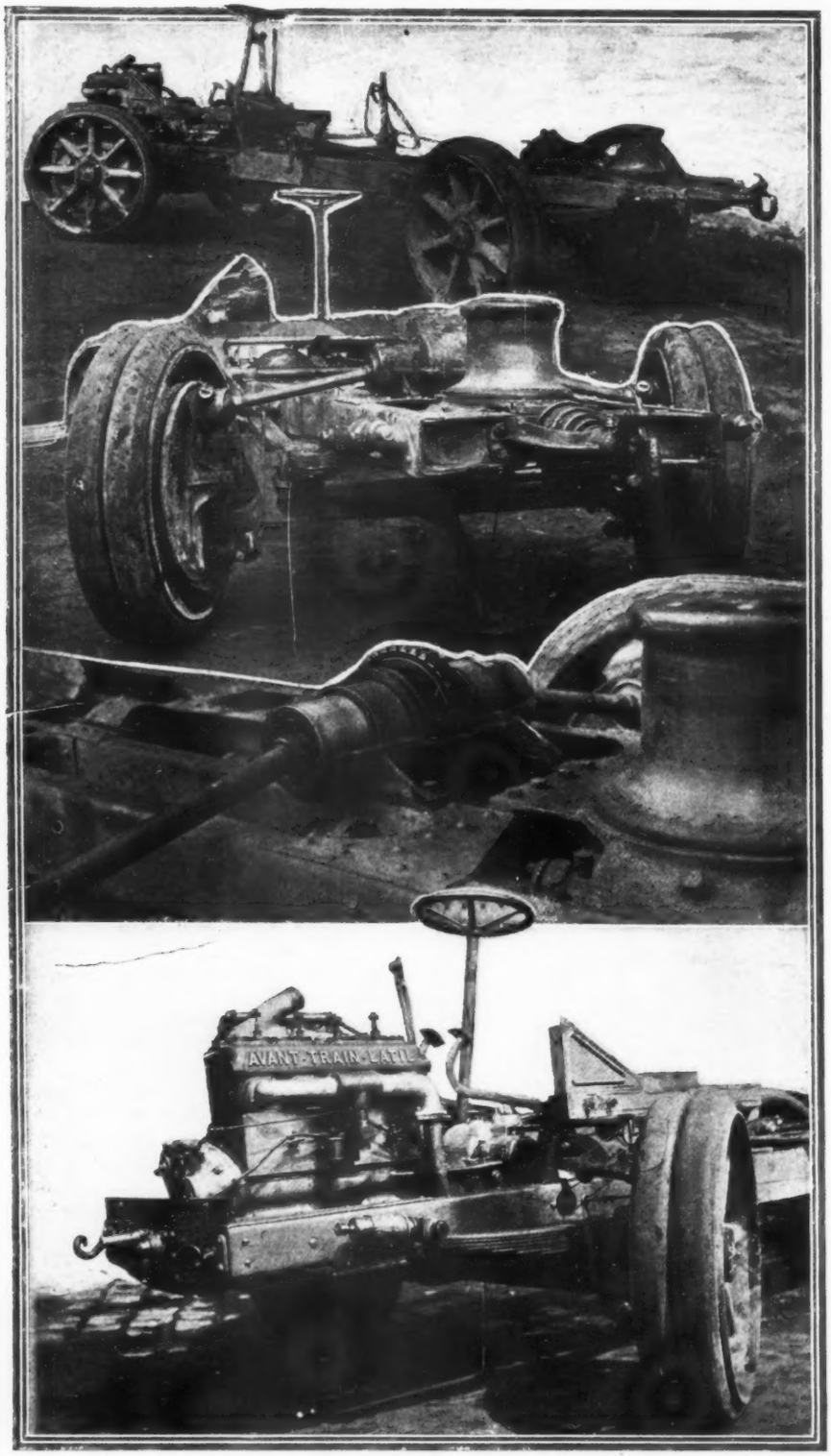
SUBSIDY MODELS

Delahaye	4 models
Latil	2 models
Berliet	4 models
Saurer	2 models
Panhard-Levassor	1 model
De Dion Bouton	1 model
Delaugere-Clayette	1 model
Brasier	1 model
La Buire	1 model
Peugeot	1 model
Aries	1 model

More than normal traces of wear disqualified the vehicle.

The hill-climbing test demonstrated the suitability of gear ratios.

Truck in French army test entirely dismantled for technical examination of parts by military authorities



Latil four-wheel drive tractor in various stages of dismantling after the completion of the 2,200-mile test by the French military authorities. The body was removed, but, not content with this, the motor was partly dismantled, the cover removed from the differential and other parts removed in order to get an accurate test on the wear of the truck. The top illustration shows the vehicle complete with the capstan over the rear axle, and also provisions for attaching the trailer. In the second illustration is shown the rear axle and the method of transmitting drive to the rear wheels by transverse propeller shafts. In the third illustration the cover of the gearbox for the axle drive shafts is removed in order to note the wear on the parts. The lower illustration shows forward axle construction with the same method of driving the wheels as used on the rear axle. In addition to being a four-wheel drive it is also a four-wheel steer

ject of eliminating steel-shod trucks. In this it was successful, for none but rubber-shod vehicles succeeded in getting the subsidy.

The hili-climbing test and the towing test on hills were rendered more severe, and, finally the technical examination was made much more searching.

Final Examination Important

This final technical examination was one of the most important features of the competition. Coming back to Versailles after a month on the road, all bodies were stripped off and the technical committee had power to order any part of the machinery to be dismounted. They did not fail to take advantage of the facilities offered them. Not a vehicle was allowed to pass without some essential organ being taken down. In some cases the trucks were pulled down entirely. As an instance, one truck had its motor and gearbox taken out. Cylinders were dismounted, lower portion of crankchamber taken off, timing gears exposed, clutch entirely dissembled, gear shafts taken out; steering gear was tested, propeller shaft was taken down, universal joints examined and differential housing opened to examine gear and bevel pinions. **If more than normal traces of wear could be found, the vehicle was disqualified.**

Fuel Consumption Noted

Some of the most valuable information regarding these trials is kept by the war department for its own benefit. Fuel and oil consumption, for instance, is carefully noted, but these figures are not communicated to the makers; each man knows what his own vehicle is doing, but has little information regarding the others. In the technical examination the reasons for disqualification are not made known to the interested party. It is only possible to judge why the officers have disqualified a vehicle by being present at the examination and noting the condition of the parts. It is recognized that this work is done thoroughly, and although there is not a great deal of publicity around the trials themselves, the results are recognized as the high-water mark of efficiency and are largely influential in effecting sales.

A certain amount of standardization is imposed by these trials. It is complete with regard to bodies; no latitude is allowed, either, with regard to clearance. All magnetos must be interchangeable, a standard pitch for side chains is being insisted on; tire sizes have been standardized

and attempts are being made to make all wheels interchangeable, and to obtain a standard size of brake shoe and brake drum. Four-cylinder motors and four-speed gearboxes are obligatory, but in all other features manufacturers are given a free hand and can suit themselves.

Several Breakdowns on the Road

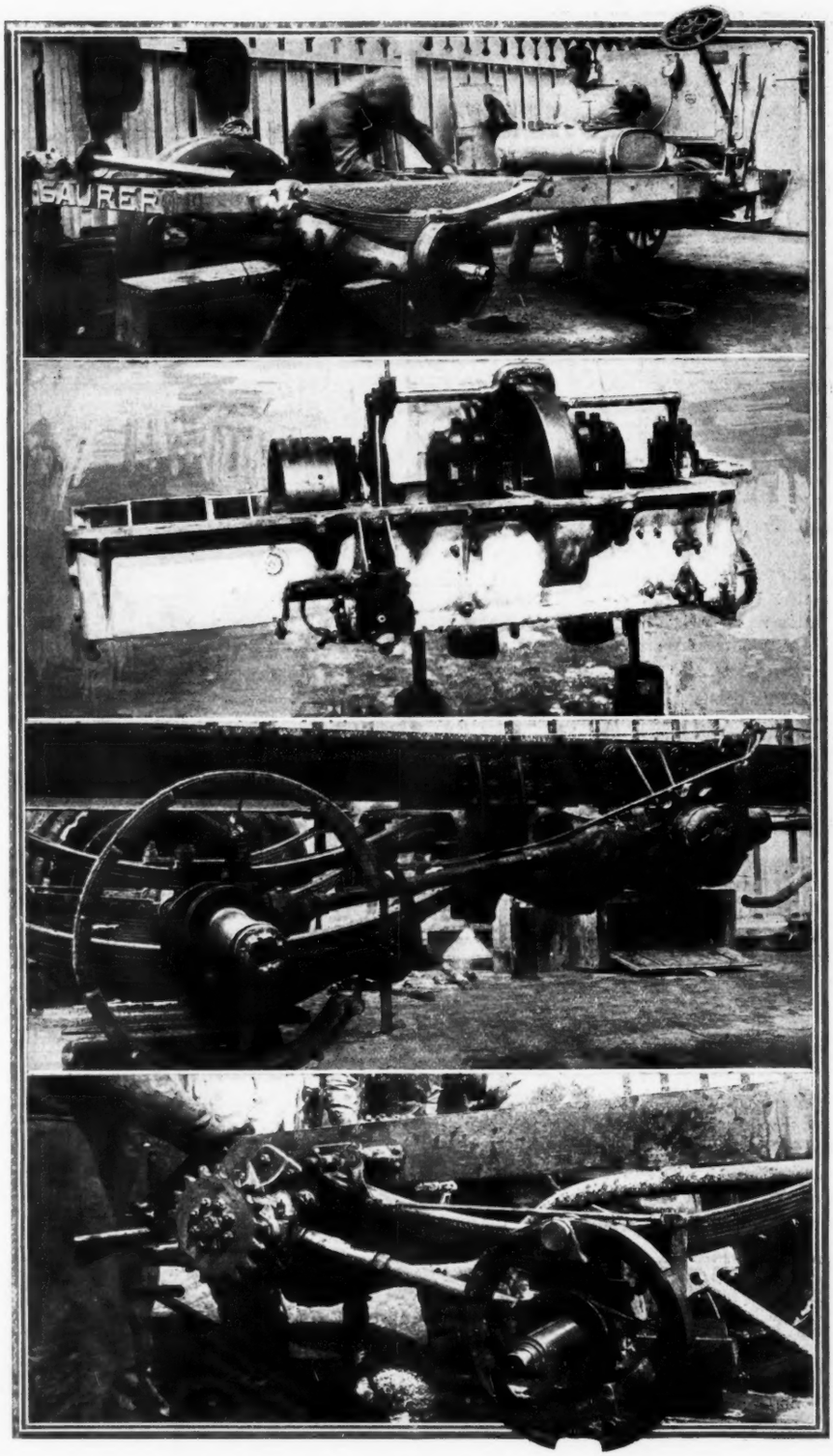
The road incidents, so far as they can be ascertained, were of a varied nature. One motor went out with a cracked cylinder, evidently due to a faulty design; on two different makes a connecting-rod bearing burned out; in each case the lubrication was by constant-level splash. There was a third case of a burned-out connecting-rod bearing; this was repaired on the road, but owing to the obstruction of an oil lead the new bearing also ran out. A connecting-rod broke on one of the competing trucks. The disabled vehicle was taken in tow by its companion, but the extra load caused the breakdown of the relief truck. Owing to leaks, three different radiators had to be fitted on one of the trucks; it covered the distance, but was not accepted. In a number of cases brakes proved to be weak or faulty.

With a few exceptions, motors were of the slow-speed type, the number of revolutions not exceeding 1,000 or 1,100. Brasier, De Dion Bouton, Clement-Bayard and Motobloc were the only ones using motors at a higher speed. In the matter of piston speeds, the highest was 24 feet 8 inches per second on the Motobloc, the lowest 13 feet 1 inch per second on the 2-ton Saurer, and the average 16 feet 6 inches to 17 feet. In the case of the Saurer, the same motor was used for the 3-ton as for the 2-ton truck, the former running at 1,100 revolutions and the latter governed down to 850.

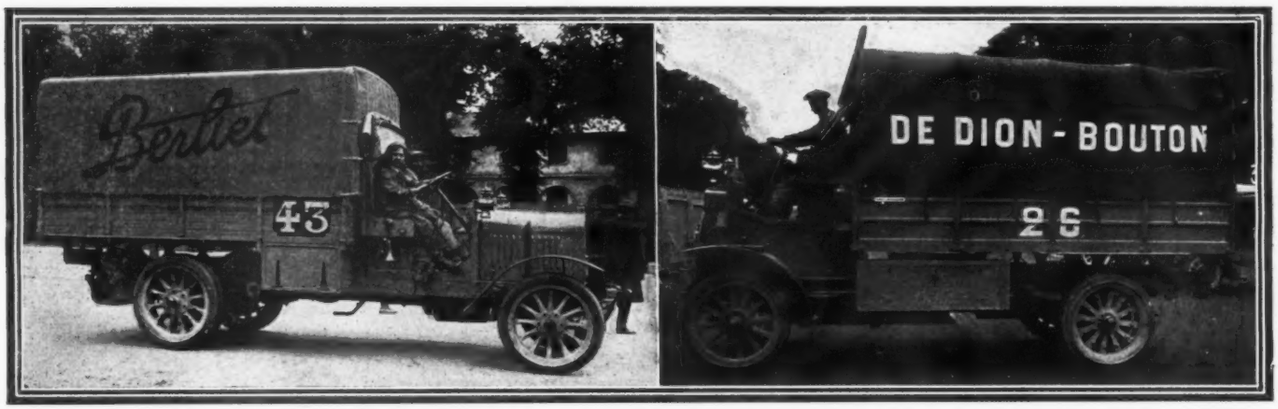
Slow Motors Poor on Hills

In the hill-climbing test the truck with a 3-ton load was entirely successful, while the slow-speed motor with only 2-ton load was unable to make the ascent. With a minimum useful load of 2 tons and a maximum of 3.5 tons, the extreme motor dimensions were 2.9 by 4.7 and 5.1 by 6.2 inches bore and stroke. The average bore and stroke was 3.9 by 5.5 inches bore and stroke. The average indicated horsepower was 22 to 25; the minimum was 14 and the maximum 45 for the tractor made by the Peugeot company.

In practically all cases the lubrication was by forced feed to all bearings or a combination of forced feed and constant level splash for the con-



Examples of technical inspection which followed the French army test. The top illustration shows the dismantled 2-ton Saurer shaft-driven truck. In the second illustration is a part of the Motobloc unit motor and gearbox showing the central flywheel located between the second and third cylinders, also pistons, oiling arrangements, etc. The third illustration is the rear system of the Aries truck, showing the double spring suspension used, also the segmental brake member. In the lower illustration is the dismantled Brasier, showing segments of expanding brake and also condition of rear wheel spindle. In the tests there were more than 47 per cent. failures. The competition was unusually severe, owing to the recognized desirability of meeting the requirements under the subsidy system. Great advances have been made in design. The inspection was exceptionally rigid and five concerns which were on the honors list failed to get all their trucks passed when it came to the final decision. Morer than normal wear in bearings and other truck parts were responsible for several disqualifications in the searching final test



Two French trucks that passed the War Department requirements and for which the purchasers can claim the army subsidy by keeping their trucks in good running condition and guaranteeing to turn them over to the army in time of mobilization

necting rod ends. High-tension ignition was used throughout. Thermo-syphon and pump water circulation were about equally represented.

The Solex coil-tube radiator with a fan in the center predominated in the competition. This is the type of radiator used on all the Paris buses.

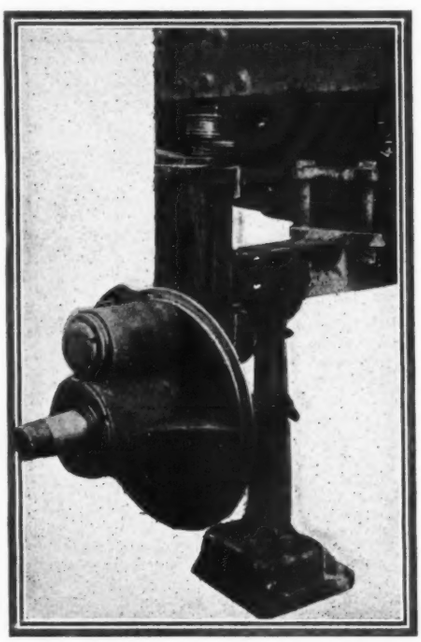
Carbureters were a varied set; in view of the necessity of using three different fuels an additional air supply controlled from the dash and supplementary hot air fitments were found on several machines. Fuel consumption was carefully controlled.

Record Kept of Oil Used

Account was also kept of the amount of oil used, but the regulations were not sufficiently severe under this heading, and it was not a difficult matter for an attendant touring car to pass up a can of oil to any one of the trucks while the army observer was temporarily absent. This fraud was not possible with the fuel.

Certain defects were noted in gear ratios and in the matter of clutches, even where side chains were not employed, direct drive was not always used, there being several cases of a double reduction in the rear axle. Among the few models with direct drive was the 2-ton Saurer with the slow-speed motor, the pinion having seven teeth.

The hill-climbing test, which proved the suitability of the gear ratios, and also the value of the clutches, took place on a hill starting at 5 per cent. gradient, increasing to 7, and finishing at 4 per cent. Each truck had to haul a companion vehicle of equal weight up this slope. In a few cases the first-speed gear ratio proved to be too high, the vehicles stopping on the 7 per cent. gradient and having to get away with the aid of the motor of the towed truck. Several of the cone clutches showed a lack of flexibility. Trucks which had climbed the 6 per cent. gradient were unable to get away on the 4 per cent. portion owing to the clutch taking hold too roughly.

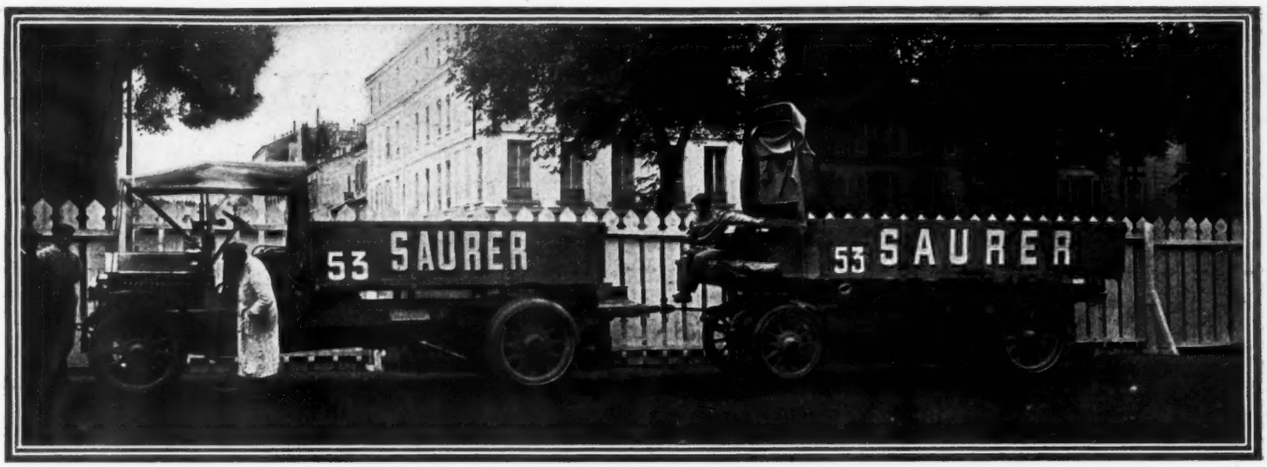


La Buire oscillating hub

Wheels Satisfactory

Wheels proved very satisfactory, there being no break-down under this heading and the general condition being good at the finish of the run. The few metal wheels which took part in the competition also gave good service. They were of two types: cast wheels and disk wheels of steel stampings. The distance covered was not sufficiently great to prove which was the better system.

Peugeot tractor and trailer which qualified for army subsidy



Saurer tractor and trailer which qualified for army subsidy

Very satisfactory wear was got out of tires. Here again the distance covered was not sufficient to prove the full value of the rubber bandages. There was only one case of abnormal wear, this being a Motobloc which had been in collision and ran a considerable distance with the front wheels out of true. As the General Omnibus Co. in Paris is averaging 21,000 miles on a set of rubber tires, trouble was hardly to be expected on vehicles covering but a tenth of that distance. It must be remembered, however, that in most cases the speed was very much higher than the official average imposed. On several of the long distance stages all the drivers maintained an average of 18 to 19 miles an hour for 3-ton trucks and the heavy tractors showed 13 to 14 miles average for distances of 100 miles.

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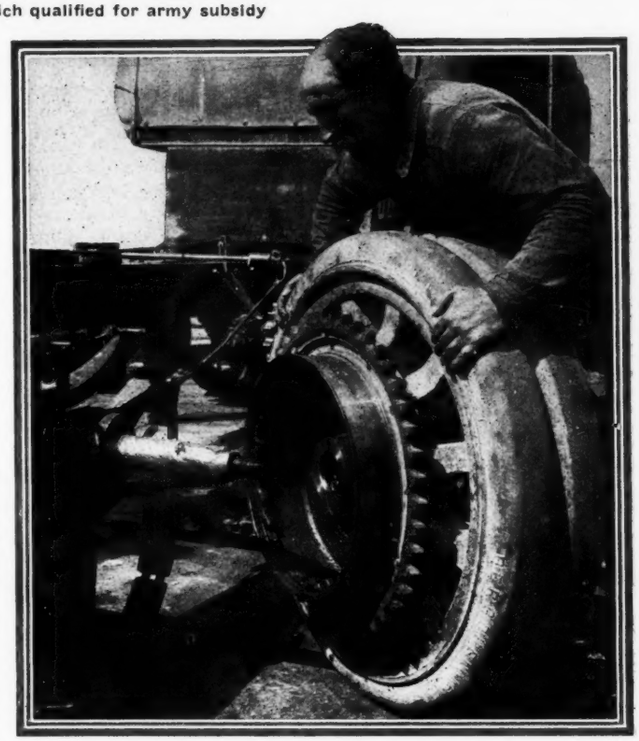
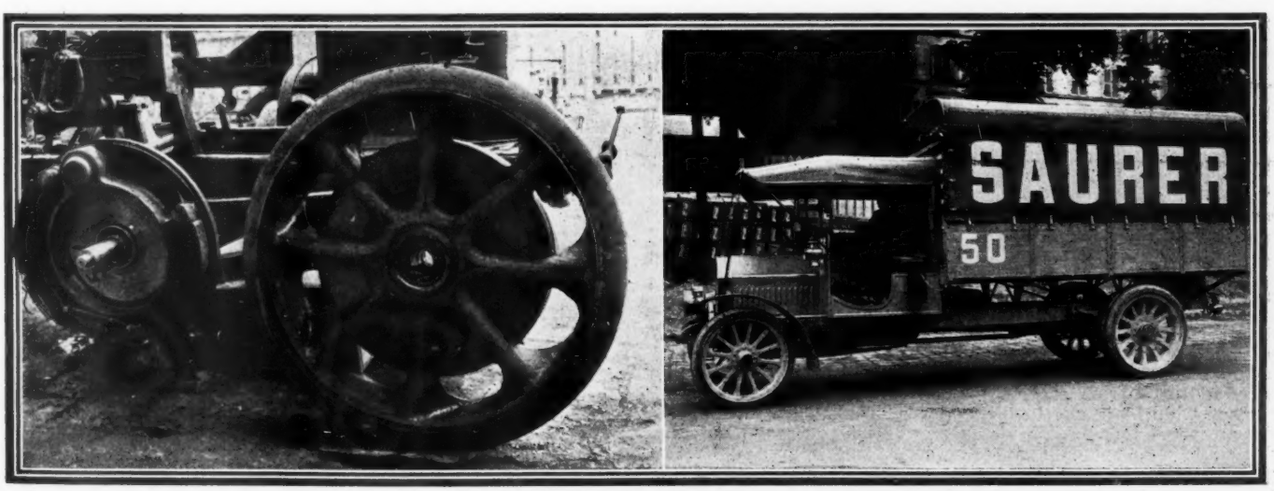
1914 French Grand Prix Assured

PARIS, Sept. 1—A grand prix race in France next year is now an assured feature. This year's well-filled season of road races, hill-climbs, competitions and demonstrations have proven to the trade in general that decided advantages are obtained from these forms of activities. There are a certain number of big self-satisfied manufacturers who would stifle all forms of demonstration, but these have been out-ruled by the more vigorous and far-seeing element. In all probability the gasoline allowance will be limited, and it is quite likely that the number of tires to be taken on each car will also be restricted. This is done in order to cause tire makers to exert greater efforts toward the production of high-grade tires, and to direct the car manufacturers' attention to the importance of low-weight and correct balance of the entire car.

While these proposals are being considered by the trade, the Sporting Commission of the French Club is already occupying itself with the question of securing an ideal course. The course for next year's grand prix must measure 18 to 30 miles round, have very wide roads, no grade crossings, few villages, and must be within easy reach of some big town capable of housing the large number of spectators drawn to an event of this nature.



Removing the rear wheel of an Aries truck to examine axle spindle



Left—Metal wheel on Latil removed for examination of bearing and brake. Right—One of the Saurer shaft-driven 2-ton models which qualified for army subsidy

Stutz and Buick Corona Winners

Cooper Drives Stutz to Victory in Free-for-All and Medium Car Races at 75 Miles Per Hour—Oldfield Wrecked But Not Injured After Driving Spectacularly—Buick Wins in Light Car Race

The Results

Free for All 301.81 Miles.

POSITION	CAR	DRIVER	TIME	REMARKS
1	Stutz	Cooper	4:02:38	74.7 M.P.H.
2	Fiat	Verbeck	4:10:20	72.5 M.P.H.
3	Fiat	Hill	105 laps	Flagged
4	National	Jeanette	77 laps	Flagged
5	Fiat	Tetzlaff	90 laps	Engine trouble
6	Mercer	Oldfield	59 laps	Wrecked
7	Stutz	Magonne	41 laps	Magneto trouble
8	Mercer	DePalma	24 laps	Cracked cylinder
9	Mercer	Wishart	12 laps	Burned bearing

Medium Car Race 251.97 Miles.

1	Stutz	Cooper	3:21:29½	75.0 M.P.H.
2	Marmon	Caldwell	4:09:31	60.5 M.P.H.
3	National	Jeanette	77 laps	Flagged
4	Marion	Wilsen	60 laps	
5	Mercer	Oldfield	59 laps	
6	Stutz	Magonne	41 laps	Magneto trouble
7	Macomber	Leach	17 laps	Engine trouble
8	Macomber	Mansfield	25 laps	Engine trouble
9	Mercer	DePalma	24 laps	Cracked cylinder
10	Mercer	Wishart	12 laps	Burned bearing

Light Car Race 102.45 Miles.

1	Buick	Waterman	1:37:20	67.7 M.P.H.
2	Reo	Jackson	1:41:06⅖	60.7 M.P.H.
3	Studebaker	Goode	1:56:12	52.8 M.P.H.
4	Ford	Schanck	35 laps	Flagged
5	Studebaker	Rhoades	36 laps	Wrecked
6	Maxwell	Crawford	36 laps	Wrecked
7	Ford	Owen	37 laps	Flagged
8	Studebaker	Trooe	32 laps	Flagged
9	Maxwell	Caldwell	20 laps	Engine trouble
10	Ford	Pratt	11 laps	Clutch trouble

LOS ANGELES, CAL., Sept. 9—*Special Telegram*—Earle Cooper, in a Stutz, and Waterman, in a Buick, won the three road races held today on the 3-mile Corona circuit. Cooper took the free-for-all 301.81 miles, averaging 74 miles per hour, and was followed by a Fiat 8 minutes back. The honors of the medium car race of 251.97 miles, which was run simultaneously with the free-for-all also went to Cooper at a speed of 75 miles per hour. A Marmon was second averaging 60.5 miles per hour. The light car race 102.45 miles, was captured by the Buick at 67.7 miles per hour with a Reo second but 4 minutes behind it.

Although eliminated from final victory, Barney Oldfield in a Mercer proved the start of the meet until he was wrecked by a wheel collapsing in the sixtieth lap, at which time he had a good lead on Cooper, then running in second position.

It seems fated that Pacific coast racing classics are always to be won by Pacific coast drivers. The best drivers of the East have tried repeatedly, but without success. Today in the three events over the new circular course each event was won by a Californian, Earle Cooper and Waterman.

Cooper's victory follows his success in the Santa Monica just a month ago. And like the former race the contest was between Cooper and Oldfield in the Mercer, until the veteran track driver was wrecked. Until he came to grief, Barney drove a wonderful race and was leading the ultimate winner by two laps. The wonderful work of this veteran was one of the features of the stirring contest.

That Oldfield is not to die under a wrecked car was again demonstrated today when his Mercer turned over and over in the sixtieth lap, plunging into the crowd and piling up against a pepper tree. A few minutes later the veteran calmly walked to the stand, still smoking his cigar. Hippodromer or not, Oldfield showed today that he is as good as the best. The accident was caused by the right front tire leaving the rim and the wheel collapsing.

Almost from the start it became apparent that it was to be a battle of tires. The heavy Fiats began coming into the pits after the eleventh lap and from then on Tetzlaff, Verbeck and Hill were regular callers. Cooper and Oldfield made their share of changes. De Palma and Wishart who came West for this event, came to grief early in the race. Wishart went out with a burned bearing and De Palma cracked a cylinder on his Mercer.

The race was witnessed by over 100,000 people, forming a solid mass around the 3-mile course.

The light car event was won by Waterman in a Buick, the 102.45 miles being covered in 1 hour 37 minutes and 20 seconds. He had a substantial lead of over 3 minutes on Jackson in a Reo. Goode, in a Studebaker, was third. William Rhoades and Warren turned over in a Studebaker and both were hurt, Warren received a fracture of the skull and was the worse hurt of the two. H. Sandhoffer, mechanician, received a slight concussion of the brain when Oldfield turned over.

The medium car race was ninety-one laps, 251.97 miles. This race and the free-for-all were combined in one.

In the medium class, Cooper's time was 3:21.29 1-2; the Marmon was second and the National third.

In the free-for-all at 301.81 miles, Cooper led Verbeck at the finish by 8 minutes and 18 seconds. Hill, in the Fiat, was third, being flagged with four laps to go.

Oldfield and Cooper jumped to the front at the start. At the end of ten laps Oldfield was leading by 19 seconds. Barney changed a tire in the fourteenth and Cooper in the fifteenth lap.

At the end of the fifteenth Cooper was a short distance ahead of Oldfield and a half a lap still separated them at the end of twenty laps.

Cooper stopped in the twenty-third to change a tire and Oldfield took the lead. In the twenty-fourth Barney stopped for a tire and Cooper again led. On the twenty-seventh lap Oldfield passed Cooper in front of the stand. Oldfield stopped again in the thirtieth lap. At the end of thirty laps Magonne in the other Stutz held a slight lead, with Cooper second. Oldfield began to hit it up from here on and led in the thirty-fifth, fortieth and forty-fifth laps. Oldfield was driving fast at this stage and with fifty laps finished was leading the Stutz by two laps. At the end of fifty-five laps Barney led Cooper by 2 minutes.

When Oldfield came to grief, Tetzlaff in the Fiat took up the running and was a close second for lap after lap until engine trouble put him out of the running in the ninetieth lap. From there on Cooper had the race well in hand but Verbeck and Hill were always within hailing distance.

The Corona course is a newly constructed one, 3 miles in length, perfectly level and in the shape of a circle. The City of Corona is encircled by it and as the course is lined with evergreen shade trees it is ideal for the spectators. Ten thousand dollars will be divided among the winners but the added $1,000 to the driver, averaging above 78.72 miles per hour, the record set in Santa Monica last year, goes begging.

Disbrow Lowers Western Track Mark

DAVENPORT, IA., Sept. 1—Six thousand five hundred people saw Louis Disbrow, driving his Simplex Zip, cover a mile in 53 seconds and lower the western dirt track record for the distance at the mile track here today. The former record at the local track was 58⅗ seconds made by Burman several years ago. The homestretch turn was in such poor condition that Disbrow, driving his Jay-Eye-See, was a disappointment. In the one-mile exhibition class Heinemann, in a Case, made the distance in 59⅘ seconds; Disbrow, in a Simplex, 58⅘, and Endicott, in a Case Special, 55⅘. In the 3-mile race Heinemann made the best time with 3:29. In the 5-mile event Disbrow made the distance in 5:38. He also won the 5-mile free-for-all in his Simplex, 5:30⅗, likewise the two mile free-for-all handicap, in 2:30.

NEW YORK CITY, Sept. 10.—C. Arthur Benjamin and the Knox Automobile Co., of Springfield, Mass., were made co-defendants in suits for damages brought by William Miner and the estate of Seth Smith as a result of the disastrous automobile race of 2 years ago at the Syracuse State Fair, when Mr. Oldfield's Knox car ran amuck, killing eleven people.

Rim Committee Discusses Strength Tests

Passes Tentative Resolution on Strength Requirement to Cause Further Debate—Detroit Section Meets and Talks Over Wood Bearings—State That Non-Lubricated Wood Bearings Give Satisfaction Under Light Load

NEW YORK CITY, Sept. 10—The meeting of the pleasure car wheels division of the standards committee of the Society of Automobile Engineers, held at the headquarters here last night showed that considerable advancement is being made in the work of this important sub-committee.

At the last meeting of the sub-committee it was decided that the matter of strength had to be taken up in order that definite data to work upon should be secured. The Hartford and Goodyear rubber companies voluntered to make independent tests on the rims now on the market to secure figures on ultimate strengths under bursting pressures and to make examinations as to the cause of failure in each case. The figures resulting from these tests were submitted to the sub-committee last night and furnished an excellent foundation for the next step forward.

The rims were divided into two broad classes distinguished from each other by the side ring. Those having no side rings made up one classification and those having one or more constituted the other class.

Eighteen Failures in Seventy-Eight Tests

There were thirty-five rims tested by the Hartford company and forty-three by the Goodyear. In the tests the total number of rim failures were eighten in the Hartford tests and fourteen in the Goodyear. The Hartford eighteen were made up of ten of the clincher type and eight straight side. The Goodyear failures were twelve for the clincher type and two of the straight side. The failures in the clincher type were to a large extent due to rolling over the retaining rings.

The method of conducting the tests was as follows: An air bottle was attached to the tire and the valve merely cracked allowing a slow flow of the air from the bottle to the tire. Two gauges were used, one located at the bottom and the other at the tire valve. The rims were observed and calibrated frequently during the process of inflation. The pressure in many cases was well up toward the 300 mark before any signs of failure was noted.

A letter by Mr. Ferguson outlining his ideas was given considerable attention as his estimate of the required ultimate strength was considerably above the mark which seemed to be required in the opinions of the members of the sub-committee.

As a tentative suggestion, it was moved to specify a bursting strength of 200 pounds for the 3.5 to 4-inch and 225 pounds for the 4.5 to 5-inch size. This motion is to be submitted to the entire committee for discussion. In addition to this motion it was also decided to put the matter in the hands of the Clincher Tire Association for debate. Howard Marmon and J. H. Wagenhurst went on record as favoring 250 pounds as the higher limit. The data will be mailed complete to the entire committee in order to bring out further discussion.

Detroit S. A. E. Considers Oilless Bearings

DETROIT, MICH., Sept. 8—The Detroit Section of the Society of Automobile Enginers gave its attention on September 4 to the subjects of oilless bearings and a new type of worm gear differential.

Leigh S. Bache, general manager of the Graphite Lubricating Co., Bound Brook, N. J., dealt with the oilless bearing both in the impregnated wood and the graphite filled metal forms. He cited the case of a mill 200 years old which had been only recently torn down, in which the gears, shafting and bearings were of hard wood. For the last years of its operation no oil had to be given the bearings for they had become so thoroughly soaked with oil for nearly 2 centuries that they had become self-lubricating. The modern wooden bearing, however, gets its lubricating properties before, rather than after it is put in use. In the process of making the wood is subjected to from 2 to 5 days' treatment in kettles, where all the moisture is driven out and the graphite filling takes its place. The wood used is hard sugar maple and it is stated that after the treatment it will not swell at all if placed in cold water and only a very little if subjected to the action of water of considerably higher temperature.

Where light loads are employed the wooden bearings give excellent satisfaction, no matter what the speed of the shafts. They are especially good on tool grinders because the particles of the wheel and the metal which get into the metal-to-metal journals and cut them out will imbed themselves in the wooden bearing and remain there without doing any damage.

In the graphite-lined or filled bearings both the composition of the metal and the filler are important as is also the pressure with which the mixture is forced in place. The bronze must be both strong and stiff. The mixture must be of a composition and put in at a pressure that will not run out if the temperature of the bearing rises or washes away when oil is used while a surface is being reached. The greatest menace to a good mixture is the presence of too much talc in the graphite. Mr. Bache had a spirit stove with him by which he demonstrated tc permanence of is bearing when subjected to high temperatures. He stated that 10 to 20 tons pressure per square inch was used in forcing the mixture into the grooves in the metal.

When asked about the co-efficients of friction at different bearing pressures, Mr. Bache was unable to give any experimental data on this particular point, but said that where the graphite filled bearings had been used to replace troublesome babbitt bearings the length of the journals had not been increased.

The second paper of the evening was given by W. S. Muehl, in explanation of the claims and construction of the M. & S. Differential made by the M. & S. Gear Co., of Kansas City and Detroit. The components of this differential consist of eight spiral gears, six gears being journaled in the housing and two attached to the ends of the axle shafts. The teeth are cut at an angle of 45 degrees. The delivery of power to the housing may be by any of the usual methods, chain, bevel or worm. The six gears in the housing have no rotative powers of their own and when the two wheels have to travel the same distance they form a lock very similar to the small gears in the conventional differential. It is claimed, however, that the action of the M. & S. differential differs from that of the usual type in that it is governed by the distance that the wheels have to travel rather than by the tractive resistance and the distance, as is the case of the ordinary type.

It is said that if one wheel were raised off the ground, as on changing a tire, the wheel could be turned very easily by hand, but that if the motor was started and power delivered to the ring gear the wheel on the ground would pull the car off the jack.

Discussion Was Animated

A great deal of discussion ensued and the members were not quite satisfied that the action was not due entirely to excessive friction within the differential rather than a new principle of operation. However, Mr. Muehl said that they had built a gear with finely polished teeth and ball thrusts behind the spirals and that the action was as satisfactory as in the commercially-made gears.

Ernest Fried made a few remarks on a roller clutch differential which is being developed by the interests back of the Disco company.

Electrical Show Making Progress

NEW YORK CITY, Sept. 10—Preparations for the Electrical Exposition Motor Show which will be held in Grand Central Palace, this city, Oct. 25, are making good progress. Features of the show from the electric vehicle user's viewpoint will be a model garage, showing and containing electric vehicles. It will be equipped exactly as a city garage should be fitted out and connected with it will be model repair shops and battery rooms. Most of the third floor will be given over to a demonstration track which will be a 100-yard oval. Demonstrations and gymkana races will be held during the exhibition.

Truffault-Hartford Shock Absorbers at Elgin

Through an oversight, the shock-absorber equipment of the cars whihc started in the 2 days of racing at Elgin was omitted from the equipment table published last week. Truffault-Hartford shock-absorbers were fitted to every one of the cars that started, except one, and that car ran only 35 miles.

Big Machines Increase Regal Efficiency

Company Adds Special Equipment That Covers 8,250 Square Feet—All Make for Greater Production at Less Expense

TO market a popular priced automobile at a profit is becoming a harder problem each year, and with greater competition, engineers, designers and factory managers must reduce manufacturing cost to a minimum by resorting to every kind of labor-saving machinery possible. In fact, so strenuous has the game become that many of the makers have employed high-salaried efficiency experts who do nothing save watch over the general manufacturing system and seek to devise single machines to do the work formerly done by several men or machines, or simplified processes which, though productive of parts as good as or better than those made under less advanced methods, are nevertheless less costly.

Recognizing these demands of modern manufacturing, the Regal Motor Car Co., Detroit, recently installed a number of new improved automobile parts-making machines, which cover 8,250 square feet of floorspace. Several of the latest machine tools which will aid in the making of Regal cars to sell around $1,000 are shown in the accompanying illustrations. Fig. 1 illustrates a Foot-Burt cylinder boring mill which bores all four cylinders of the block casting at once. The casting is mounted in a jig as seen and the big mill is set in operation immediately. It turns out thirty four-cylinder castings each day.

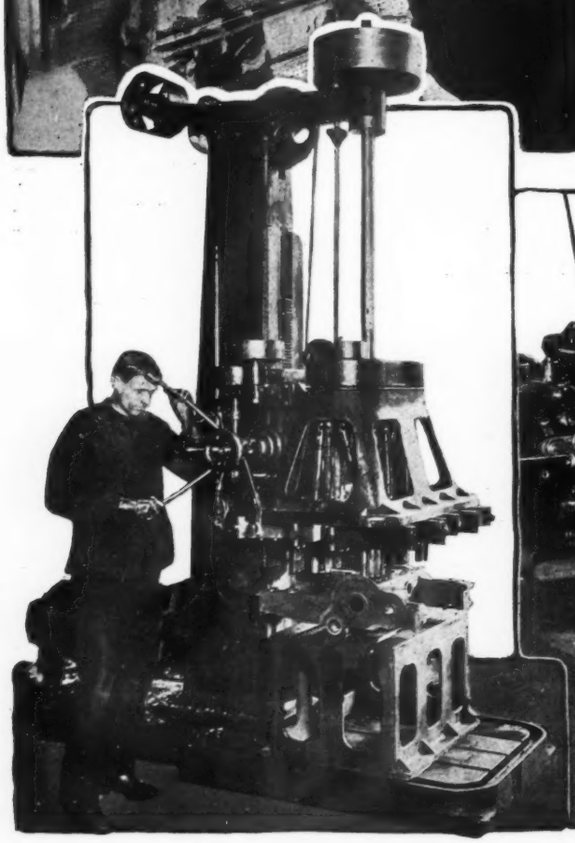
Another of the new Regal battery is seen in Fig. 2. It is a Baush multiple drill having twenty spindles. This modern machine drills all of the holes in one side of a crankcase at one time, and has a capacity of fifty crankcases per day. Fig. 3 shows the Regal Company's new battery of gear hobbing machines, which, four in number, cut gears for twenty motors per day.

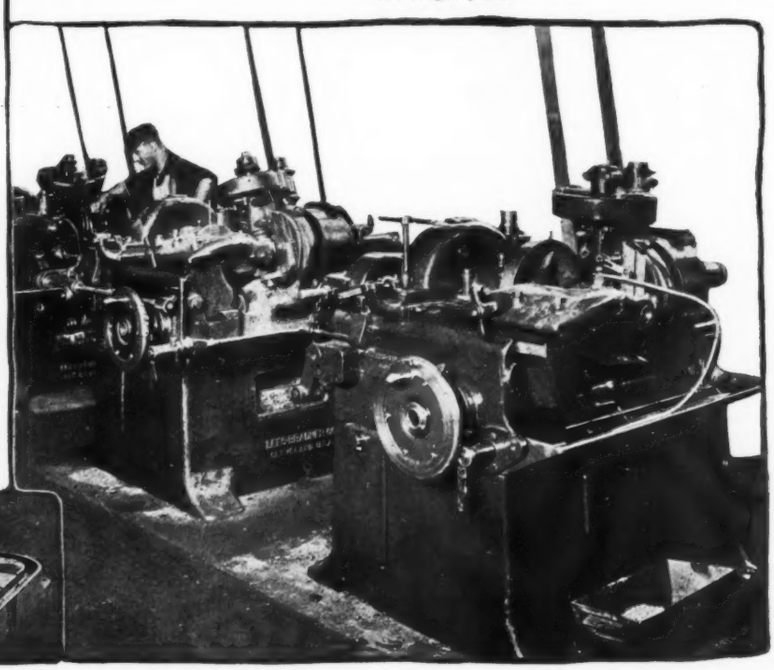
The other new machinery at the Regal plant consists of an eight-spindle boring and reaming machine having a capacity of thirty castings daily; a vertical milling machine which can operate on twenty crankcases each day; a horizontal milling machine of equal capacity; an automatic chucking machine capable of turning 100 pistons in a day; besides radial and upright drills, turret lathes, engine lathes, cylinder grinders and other miscellaneous tools.

Fig. 1—(Upper) Foot-Burt cylinder boring mill used in the plant of the Regal Motor Car Co., Detroit, Mich.

Fig. 2—(Lower left) Baush multiple drill with twenty spindles used in the Regal factory

Fig. 3—New battery of gear hobbing machines recently installed at the Regal plant





Overland Company's Aluminum Foundry

Modern Methods of Molding and Casting Are Used

¶ Until recent years, and for some reason not easily explained, foundry practice does not seem to have been able to keep in stride with the enormous advances tending toward big and rapid production that have taken place in the other departments of large engineering plants. This apparent lack of efficiency applies more particularly to the working methods and the arrangement of the various departments in the foundry rather than to development of the separate units constituting the plant. An inspection of the larger automobile factories, however, shows that this condition of things is being quickly changed. Improvements in the methods of work that will greatly increase the productive capacity are noticeable in many quarters.

An instance of a modern foundry in which there is ample evidence of careful consideration of the sequence of work as it passes through the various processes from the raw material to the final dispatch of the castings to the machine shops is the large aluminum foundry recently put into operation at the Overland plant at Toledo. In this foundry are cast all the aluminum parts in the construction of the Overland car, crankcases, manifolds, spiders, etc., as well as all brass and bronze parts. Its full capacity has not yet been ascertained but there has been turned out with ease between two and three hundred of each of the aluminum pieces in the makeup of the car per day. This probably represents about 12 or 13 tons of metal, about one-fifth of which is brass. The maximum capacity of the foundry is likely to be about twice the figures mentioned.

A plan of the new building is shown in Fig. 1. Its great size will be realized by referring to the dimensions. The total length approaches 300 feet and this includes the main shop in which the bench molders work, measuring 157 feet long by 100 feet wide, with an irregularly shaped core room at one end and a cleaning and inspecting room 100 feet by 40 feet at the other.

Besides these three main departments there are also the furnace room and three storage rooms for metal, molding sand and core sand respectively. The storage rooms are located together.

The efficient arrangement of the entire handling scheme is brought out in the plan. It will be noticed that all three store rooms are skirted by the railway tracks arranged so that the sand or metal can be taken in directly by chute from the freight car. A second door in each of these rooms is in direct communication with that department of the foundry for which the material is wanted, that is, the metal passes straight into the furnace room, the molding sand in through one corner of the main shop to the molders, and the core sand after preliminary mixing into the core making department. Having arranged the departments most efficiently as regards location a second factor contributing to speedy operation is the installation of an overhead trolley system. This is indicated in the plan by dotted lines and can be said to have three starting points, the metal room, sand room and core department, finishing in the cleaning and inspection department at the opposite end of the main shop. Between these points the trolley is capable of taking care of all transport throughout the foundry. Small turntables are incorporated in the system at the center to obviate unnecessary travel in passing the load about the molding shop.

Dealing briefly in turn with the departments, the molding shop

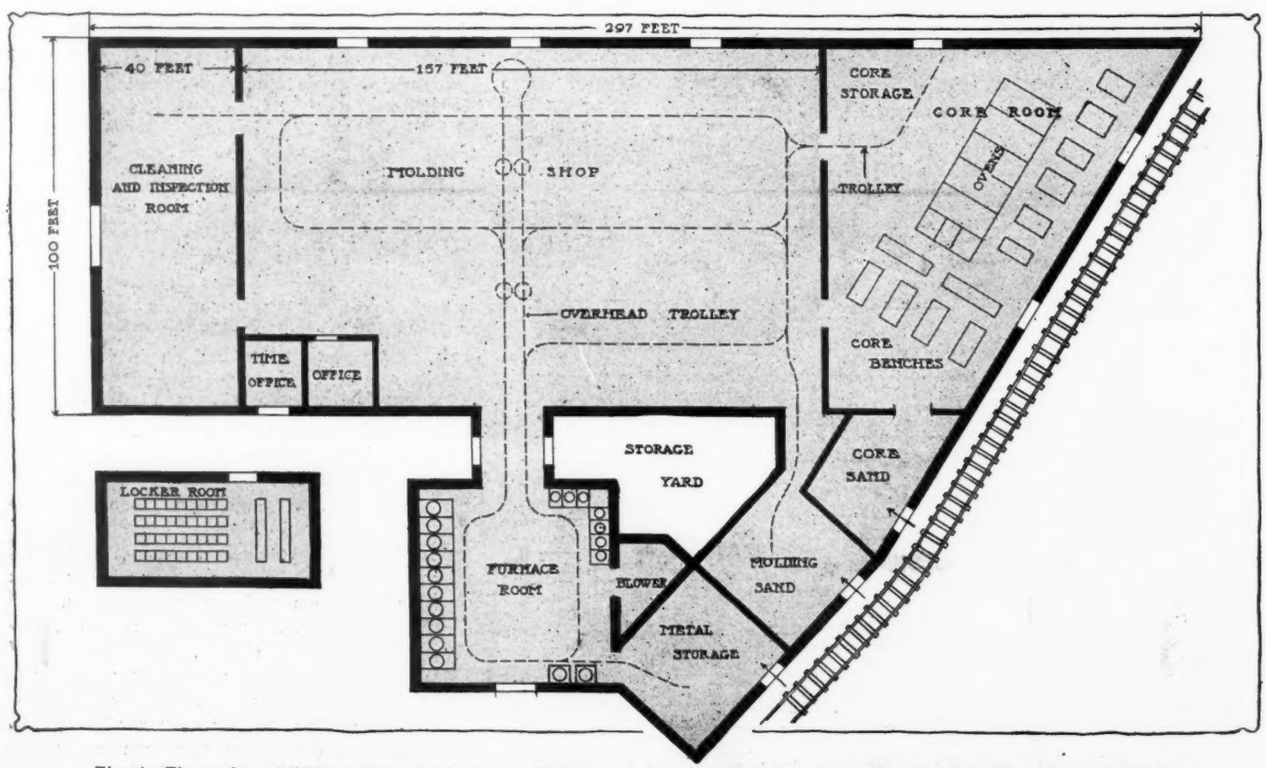


Fig. 1—Floor plan of Willys-Overland foundry, Toledo, O. Note large locker rooms for the benefit of the employees

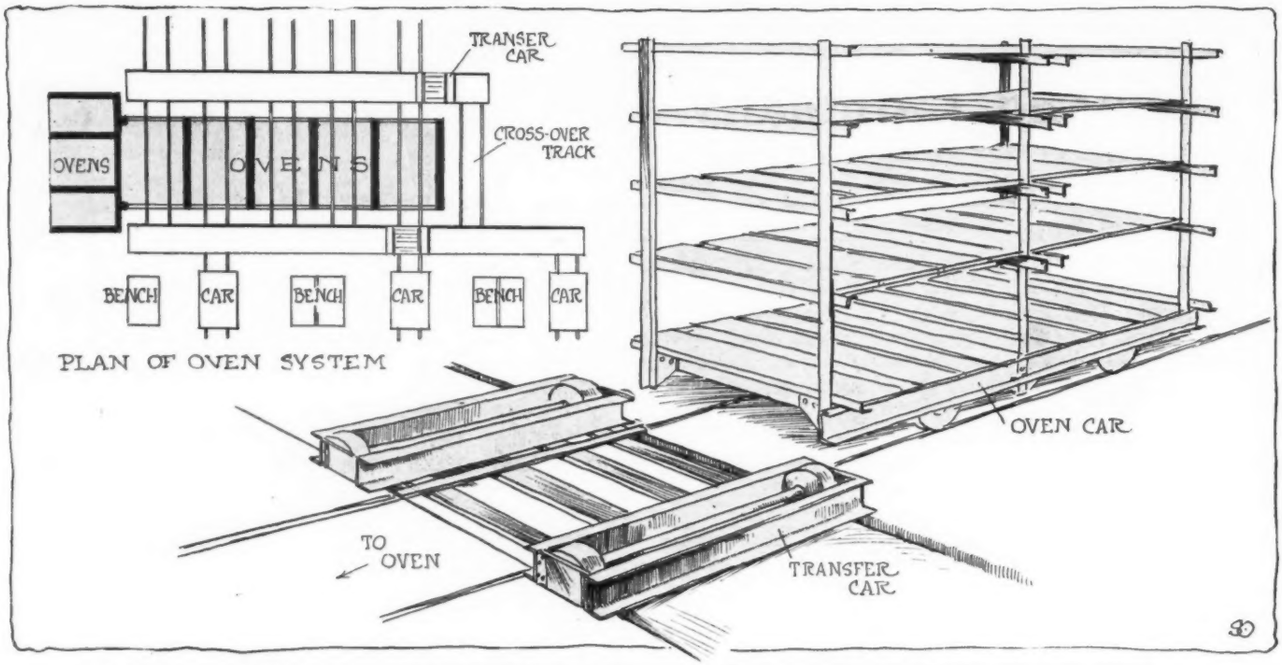


Fig. 2—The car benches are arranged alternately with oven cars of steel construction, provided with four shelves

consists of a large undivided room exceedingly well lighted having almost entirely glazed sides, and roof lights in addition. The molding benches are distributed about in regular lines with ample floor space around them. A light portable bench of angle iron, shown in Fig. 4, is used as standard for all the smaller flask work. These are arranged at the end of the shop nearest to the cleaning department, the heavier work being done at the other end, where the larger quantities of sand and the baked cores necessary are more quickly available. Aluminum flasks are used for ease of handling.

The furnace room measures 54 feet square and is situated apart from the main building with a communicating passage way. The furnace blower is located in a small room at the side. A bank of sixteen furnaces used only for aluminum is arranged along one side of the furnace room while an opposite corner is filled with a set of brass furnaces. Two special furnaces complete the equipment. The trolley line passes immediately in front of all the furnaces so that the ladles of molten metal can be speedily transferred to the molds.

Core Making Operations in Sequence

Perhaps the most interesting department is the core room. This is a four-sided room measuring 100 feet on the longer sides. The drying ovens occupy a space in the center with the coremakers' benches disposed around two sides. By this arrangement it will be seen how there is no time lost in the passage of the sand from the storage room to the benches, where it is made up into the cores, then dried in the ovens and finally carried by the trolley into the molding department.

The ovens themselves possess many features of great interest. The main set consists of five equally sized brick ovens with doors at both ends. In addition, some smaller drawer ovens for the small cores are arranged at one end of the set. The coremakers' benches nearest the sand room are devoted chiefly to the making of the small cores that are dried in these drawer ovens. The larger core work is executed on the benches situated in front of the ovens. By referring to the plan it will be noticed that the core benches are arranged alternately with oven cars. These latter are of steel, running on wheels and provided with four open shelves. An idea of their appearance is given in Fig. 2. Rails of a gauge to accommodate the truck wheels pass right through all the ovens. Immediately in front and behind the ovens a recess in the floor forms a track for a transfer car shown in the same illustration. This car has rails transversely placed across it that coincide with the oven track.

In practice the system operates as follows: The core sand is first passed to every bench and on starting work an empty oven car is standing alongside each coremaker, as shown in the inset plan in Fig. 2. The work continuing, the cores

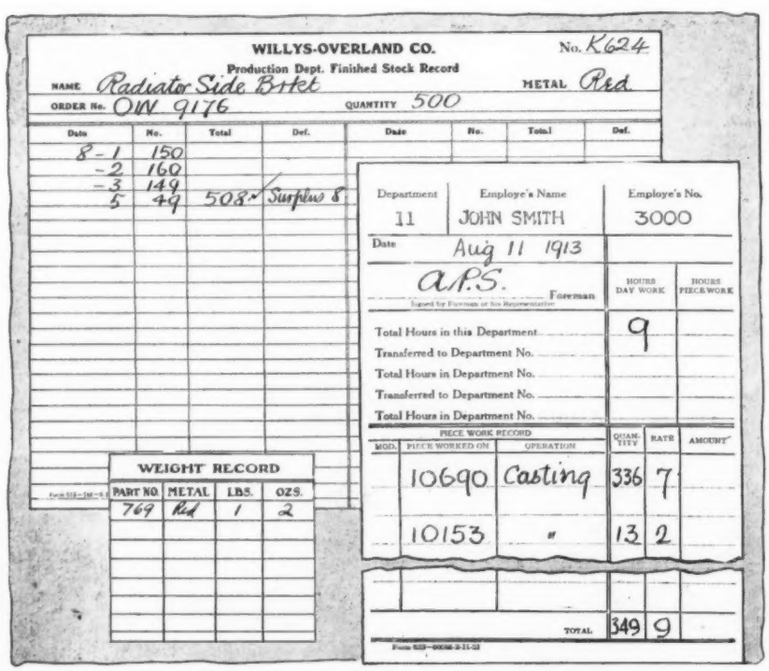


Fig. 3—Cards used in the Willys-Overland foundry. At the top is the production card, at the right the time card, and at the left the weight record

when ready are placed on the shelves of the car until this is filled. The transfer car is then brought into position, the roller-type door on the oven raised, and the loaded car wheeled in over the transfer car. If the nearest oven happens to be already in use the transfer car forms an easy means of bringing the car opposite any other oven. After drying, which process varies according to the nature of the cores, whether they are large or small masses of sand, the rear door of the oven is opened and the car passes through where the cores can be taken directly by trolley into the molding shop or stored temporarily in the adjacent corner of the core room. The car is then returned to the coremaker either through the oven, or, if the latter is already occupied, by way of the transfer track at the end.

Castings Trolleyed to Cleaning Room

Regarding the work in the molding shop this does not differ in any material respect from general practice. The benches are well and orderly arranged and the heavier castings, such as the crankcases, are made nearest to the furnace room. After pouring from the ladle into the mold, the casting is shaken out onto a tray which is then trolleyed to the cleaning department.

The cleaning room is the final department of the foundry. Here the gates and fins are cut off the castings and any chipping, rough-filing or grinding that is necessary takes place. A bank of grinders extends along one side of the room. A suction pipe fitted over each grinding wheel in communication with a suction machine installed in the shop insures the worker against breathing the ground particles of metal that otherwise would float in the air during the grinding operations. Cleanliness about the shop is another desirable feature obtained by the use of the air suction system. After careful inspection the castings are finally passed out into the machine shops.

Situated in one corner of the main shop are the foundry foreman's office and the time keeping office. In the latter a record of all castings issued by the foundry is kept. For this purpose the cards shown in Fig. 3 are used. The largest of these called the production card has space at the head in which are entered the name of the part, order number, metal and quantity to be cast. Beneath in ruled columns the date and quantity is entered as each daily batch to the order number is completed.

The time card at the right of Fig. 3 is held by the employee whose name and number is stamped at the head. Below he enters the number of the piece worked on, the particular operation, that is, casting, molding or work at the furnace, the quantity and the hours. This is signed each day by the foreman. The total hours are checked with a clock register card and the total quantity of parts with the production card.

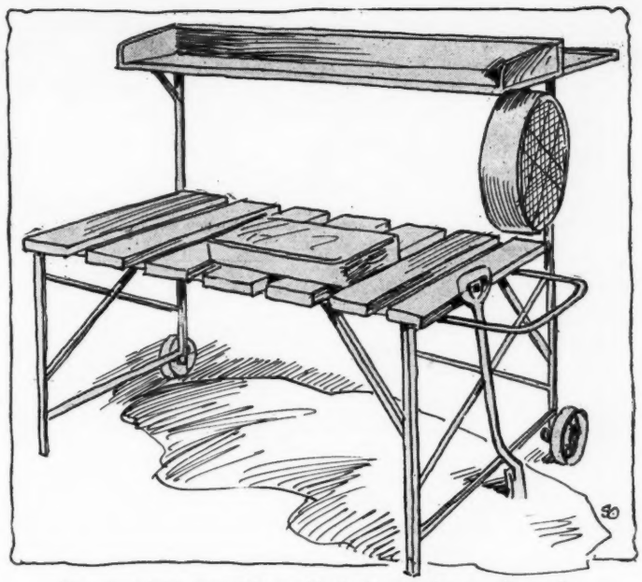
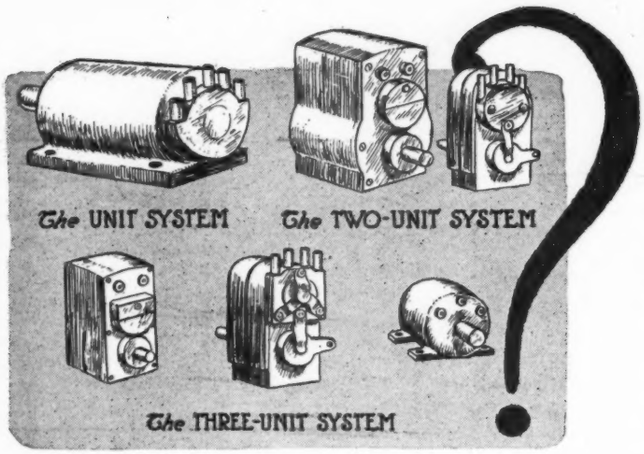


Fig. 4—Light portable molder's bench for small work

The small square card is the means of recording the weight of every casting. The pattern number, metal and weight are entered and the cards kept in order of the number.

The importance of thorough lighting at night where efficient and accurate foundry work is required is shown by the complete system of 3000 candlepower electric quartz lamps installed. Fifteen of these lamps, which are the latest product of the Cooper Hewitt Co., light the foundry, core room and furnace room. These are placed high so that there is no glare in the workers' eyes. The adequacy of the lighting and its diffused character can be realized from Fig. 5 which is from a photograph taken in the foundry at night.

Fig. 5—General view, taken at night, of the large molding shop in the new Overland foundry



Engineers Disagree On Starter Units

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Part VII

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Engineer of Keeton Co. Favors Two-Unit System, But Defends High-Tension Magneto as Most Efficient

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The Six Questions

1. *Which will be the eventual system, namely: (a) Unit system, in which starting, lighting, and ignition are combined; (b) two-unit system, in which starting and lighting are combined, with ignition separate; (c) three-unit system, in which ignition, starting and lighting are separate?*
2. *Respective methods of coupling starting motors with the gasoline motor?*
3. *Possibilities of weight reduction in starting systems?*
4. *Increased accessibility of the battery for starting and lighting purposes and if excessive initial draw from the battery is injurious?*
5. *Positive locking means whereby tampering by outsiders cannot lead to shorting and discharging of batteries?*
6. *Movement to discourage senseless demonstrations of starting motors in which they are used to propel the car for a short distance?*

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Editor's Note

Readers of THE AUTOMOBILE who are owners and operators of cars are invited to participate in the present discussion on the relative merits of combined starting, lighting and ignition units.

The three systems are best described as the unit, the two-unit and the three-unit types. In the unit type the electric motor for starting, the electric generator for battery charging, and the ignition system are in one. In the two-unit system the battery dynamo and the starting motor may be combined in one machine with a single armature. In the three-unit system there is a starting motor as one machine, the battery charging dynamo is a second machine, and the magneto for ignition is the third.

It is on the relative merits of these types that this discussion hinges. Owners who have had practical experience with them should be able to give points of much value.

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THE following communication from R. H. Brown, chief engineer of the Keeton Motor Car Co., Detroit, Mich., on the subject of the best electrical system for automobile use is the latest which THE AUTOMOBILE has received from the automobile engineers in this discussion, nearly all of the leading members of the profession having expressed their views in the last five issues. The question is one of great importance and well deserves the close attention which it has received from the engineers and readers of THE AUTOMOBILE.

A number of other communications on various engineering subjects have been received recently, and several of them are published herewith, Henry Souther contributing a dissertation on the use of wire wheels on motor vehicles, Charles E. Duryea commending a late editorial on "The Accessible Car" and W. H. Stewart giving an account of an interesting demonstration of the feasibility of using ordinary bearings in automobiles, provided they are sufficiently lubricated.

It is generally supposed that the modern automobile has been brought to a state approximating perfection and that the few improvements remaining to be incorporated in its construction are of a minor character. That this impression is erroneous is readily realized by a perusal of the communications published in THE AUTOMOBILE suggesting improvements in car design.

The discussions on various topics which have been carried on in THE AUTOMOBILE this summer have been extremely gratifying to those interested in the engineering problems connected with the automobile, and communications on any subject of this character are always welcomed by the Editor, as the more consideration is given to them the better the results obtained and the greater the progress made.

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Two-Unit System Best—Brown

DETROIT, MICH.—Editor THE AUTOMOBILE:—We are strongly in favor of a two-unit system in which starting and lighting are combined with separate ignition, as it does away with a lot of complication in the units, and we have never found any combination of lighting, starting and ignition that was as efficient as the high-tension magneto.

The high-tension magneto has reached a point of perfection where it is less liable to cause trouble, and in the case of the three-unit system it could so happen that starter, lighting and ignition entirely would be cut off providing a short circuit should occur in the wiring. We believe with a separate system of ignition that there is always less chance for ignition trouble.

We are in favor of the starter being driven by a silent chain of sufficient pitch and width, as it does away with noise, it can be housed in the crankcase and continuously lubricated, and if the chain be properly selected it will not need an idler or adjustment. By gearing the starter of the flywheel as in most cases, it is necessary to have an auxiliary motor of some sort to mesh the sliding gears easily and without noise. This leads into complication and has more or less of a tendency to cause trouble, whereas if the chain drive were used it is always positive in its connection with the starter generator.

As the greater part of the weight of the self-starter is that of the battery, we believe that weight reduction will be along the line of battery construction.

Battery Is the Weak Link

The battery is the weak link in the modern electric self starter, which should be very accessible so as to receive the attention of the owner or operator as much as possible. The battery should be mounted so that the operator would have no difficulty or excuse for not taking care of it, and it should also be mounted so that it is thoroughly protected from the weather.

It is also a very convenient item for starter and lighting batteries to be carried in such a position on the car that they can be taken out. Some batteries are so located that they can be looked after very easily, but if the occasion so arises that it is necessary to remove the battery from the chassis, it is practically impossible. This point should be taken into consideration very carefully.

We have not noticed in our experience any serious injuries to the battery owing to the excessive initial draw in storage when the battery is not abused, such as in senseless demonstration of running the car by the self starter.

Positive locking means whereby tampering by outsiders cannot lead to shorting and discharging the batteries is to be highly recommended, especially for cars that are left in public garages,

as the attendants of these garages often amuse themselves in the wee sma' hours by driving cars about the garage floor by the starter.—R. H. Brown, engineer, Keeton Motor Co.

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Comparison of Wire, Wood, Steel Wheels—Souther

Philadelphia, Pa.—Editor The Automobile:—About 1905 a sheet steel wheel was developed for the automobile industry and used for a number of years. It was an imitation of the wooden artillery wheel and looked well enough.

The wheel was the idea and development of Thomas Midgely, of Columbus, Ohio. It was well built and never gave any trouble as far as strength was concerned.

It was not generally adopted and gradually fell into disuse. The objection raised to it was that it was too stiff, too rigid, too hard on tires and too heavy. It was too high priced for the low-priced car and the high-priced car would never adopt it, as it was an imitation, too heavy and too rigid.

A sheet steel wheel, in imitation of the artillery wood wheel, may be made as light as any wheel; but when made light enough to be desirable, it is not as strong as the wooden artillery wheel. The Midgely wheel was as strong but heavier.

Sheet Metal Wheels Hollow

Any sheet steel wheel made in imitation of an artillery wheel must necessarily be hollow as to spokes and as to felloe and rim. Any hollow construction is a stiff construction, weight for weight, just as a hollow tube is stiff and rigid as compared with a piece of rod of the same weight and length. A hollow steel spoke is rigid and unyielding. It has not the resilience of a solid wood spoke, which itself is more rigid and stiff than desirable as used in artillery wheel construction.

The wood wheel is distinctly a better wheel than the hollow sheet steel wheel imitation, in the matter of elasticity and tire life or endurance.

In an accident or under excessive abuse, when injury comes to a wood wheel, it will often spring back to shape. The sheet steel wheel has no ability to recover. It buckles and kinks beyond repair. It is made up of a weak, soft, non-resilient steel. If the steel were not soft, it would not form into the shapes necessary to produce a sheet steel wheel. The mechanical operations would be too severe for a good strong steel. The steel would crack in the forming dies.

The sheet steel wheel must therefore be made of the softest, weakest possible material and must be heavy if strong enough and is non-resilient.

Extra Wheel Is Carried

The sheet steel wheel has found some favor in England for two reasons: It is cheap and it has the quick detachable feature—that is, an extra or spare wheel is carried, and this method has been proven to be the easiest way to overcome tire troubles. The automobilist of Europe has proven this during the last 6 years, in connection with the use of the detachable wire wheel.

The relative merits of wheels, as learned by experience in Europe, places the wire wheel first, the wooden wheel second and the sheet steel wheel third. This does not refer to price but to engineering merit, strength, resilience, ease on tires, ease on the car as a whole and as the nearest approach to the perfect way of meeting tire trouble on the road. Henry Souther.

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Factory Man Inappreciative—Duryea

Saginaw, Mich.—Editor The Automobile:—Your editorial on "The Accessible Car" hits the nail on the head, but it needs more "licks." The factory man does not appreciate the owner's position. So long as automobiles were exclusively used by city dwellers it did not matter so much if a little something went wrong. It was an easy matter to leave it at the garage and take a car home. But now that the country dweller is a big factor in the market it is evident that he cannot conveniently do this.

Therefore he wants a rig as simple as can be in the first place and designed so he can remedy the small troubles before they become large ones. On this account accessibility is a most important feature and one about which we have very little information. The opportunity to conduct accessibility contests this fall is a wide open one, and the people who drive and use their own cars would be a large body of deeply interested spectators.

No particular rules or "stunts" necessary. Simply a contest to bring out the facts. How long and how much trouble to get at a piston pin bearing if it needs fixing? How quickly can the wheels be taken off? How and how long to get out a clutch? How big a job to clean out the engine base?

Dozens of questions like these should be answered with some degree of accuracy. Very few people care whether or not the parts of their car can be mixed with the parts of another promiscuously and then re-assembled without trouble.

They have pretty well learned that automobiles do wear out or go wrong, and they want to know that they can be easily fixed. They are accustomed to feeding the horse three times per day. They clean the plow every time they leave the field, or it will rust and work badly. They milk the cows twice a day, and a little attention to the automobile is expected. But it must not take a half day to make a 3-minute adjustment.—Chas. E. Duryea, Duryea Motor Co.

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Mill Bearings Adaptable—Stewart

New York City.—Editor The Automobile:—In an effort to demonstrate that ordinary bearings used in good mill or manufacturing practice could be adapted to automobile use with highly satisfactory results, and also to dispel the idea that roller and ball bearings are necessary to avoid a degree of friction comparable to a stone drag on a dirt road, there was recently constructed an automobile with a 10-foot wheel-base, two seats to carry five passengers, having a 4 foot 9 inch gauge and being 14 feet over all, 36-inch solid steel tires, 1.5 inch wire, the entire machine weighing, stripped, 600 pounds. This equipment was drawn across the Huntington and Delaware valleys in Pennsylvania by the inventor of a special design of chassis with mill bearings on wheels lubricated with Albany grease at an average speed of 3 miles per hour for 20 miles. The completed machine weighed about 900 pounds without passengers.

The inventor of the chassis, Rollin A. Whittick, pioneer of the idea of ordinary bearings for such purposes, made the entire trip as per schedule. Most of the way Mr. Whittick walked beside the car with one hand on the side, setting the steering wheel occasionally, making 3 miles per hour on level macadam roads which were not in good condition. On all down grades coasting was indulged in, and, although the machine was "stripped" the brakes often had to be used, even with the light load.

Car Moved Freely and Easily

The car moved along easily and freely on the mill bearings lubricated with the grease, meeting the greatest expectations of Mr. Whittick. The towns of Bristol and Burlington took a holiday as Mr. Whittick passed through. The bearings were carefully examined by the interested populace, who, in every instance inquired as to the type of roller and ball bearings used and received the answer that they were "good, old-fashioned mill bearings similar to the kind the railroads use," and were lubricated with grease.

Within a short time a motor will be placed in the machine and a sensation is expected to be created wherever a demonstration is given.

The trip extended from Jenkintown to Beverly, N. J., via Bristol Ferry, a distance of 20 miles. As mentioned above it was done entirely without engine power of any kind. The lubricating problem involved was that of only lubricating four wheel journals of 1 5-16-inch cold rolled steel, with soft steel tube boxes filled with grease. The "automobile-cart" was hauled the full 20 miles without undue exertion between the hours of 7 a. m. and 7 p. m.—W. H. Stewart, Adam Cook's Sons.

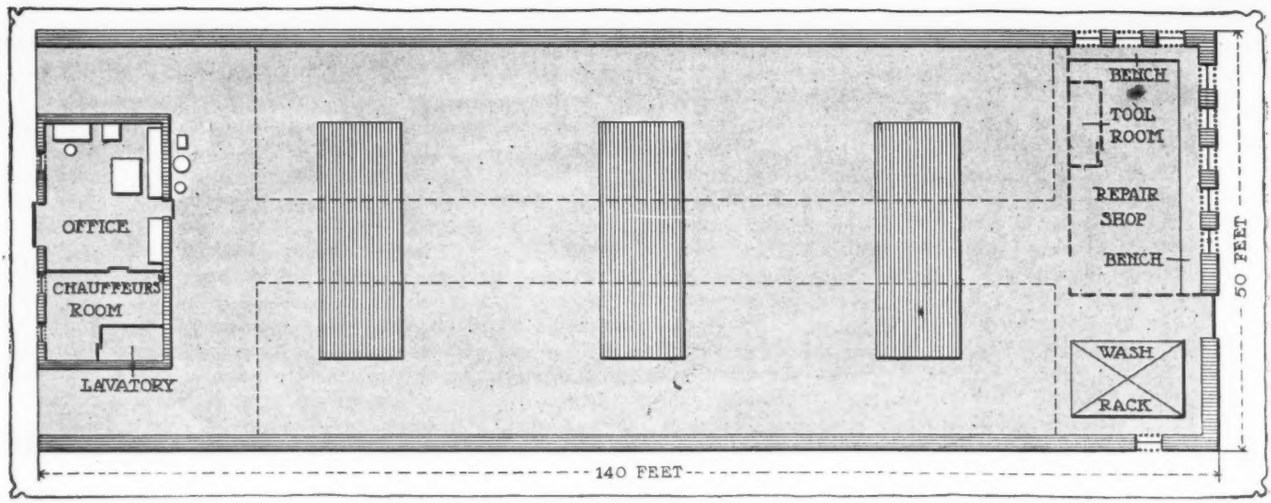


Fig. 1—Layout for a garage to be built upon a ground space 140 by 50 feet, and having the short side facing a street or road

Garage Economy Depends On Its Layout

Convenience of Those Using the Garage as Well as Celerity of Handling Cars Effected by Arrangement

LAYING out a garage is a problem which should not be taken too lightly, as on its solution depends to a considerable extent the work which will be obtained from the garage when the same is in operation. It stands to reason that as the shapes of the premises vary so must those of garages built upon them, and it matters a great deal how the space is utilized with regard to the final result.

In the following article a number of solutions for the problem of laying out a garage are proposed, assuming various shapes and sizes of lots on which the buildings are erected. In each case it is assumed that the garage is made to cover every square foot of the available ground, and the variance in shape of the buildings is the direct consequence of the difference in that of the ground.

As the first example of the garage layout, reference is made to Fig. 1, showing a plan for a garage built on a space 140 by 50 feet, with the shorter side facing the street or road. There is a 10-foot entrance and 10-foot exit at this end of the building, and between them the office and the chauffeur's room are located, there being a door from the street into the office and one from the latter to the garage interior. The best method of furnishing in a simple manner and of arranging the furniture in

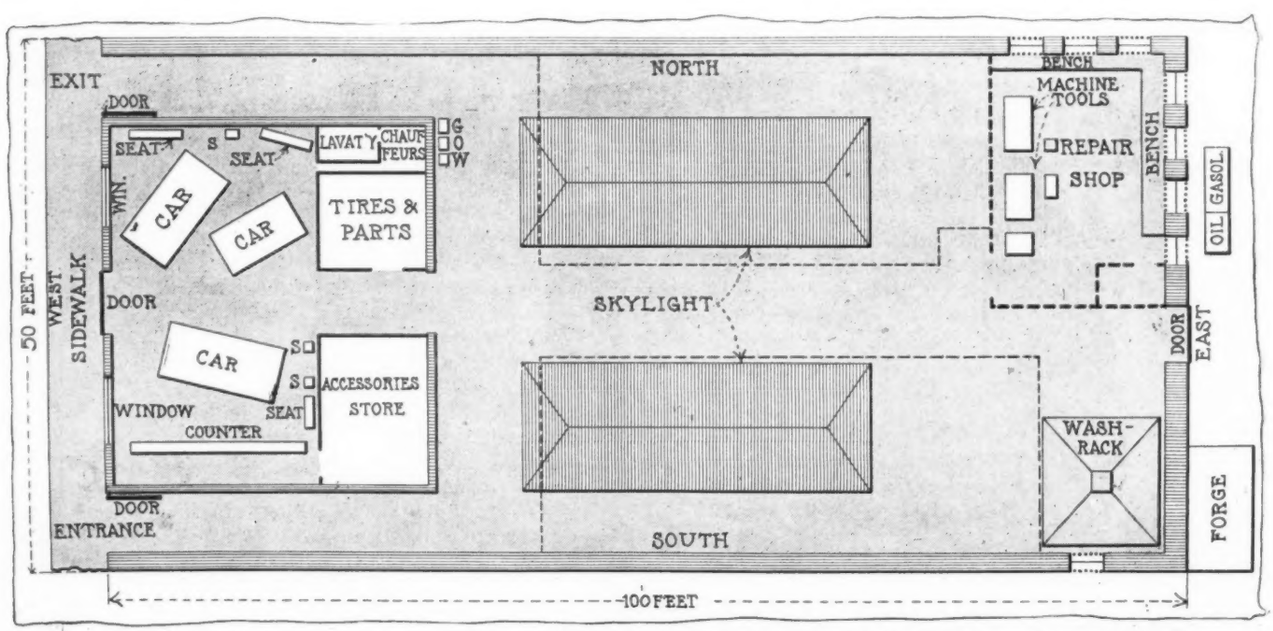


Fig. 2—Possible layout for a garage which may cover a space 50 by 100 feet, with the 50-foot lot facing the street

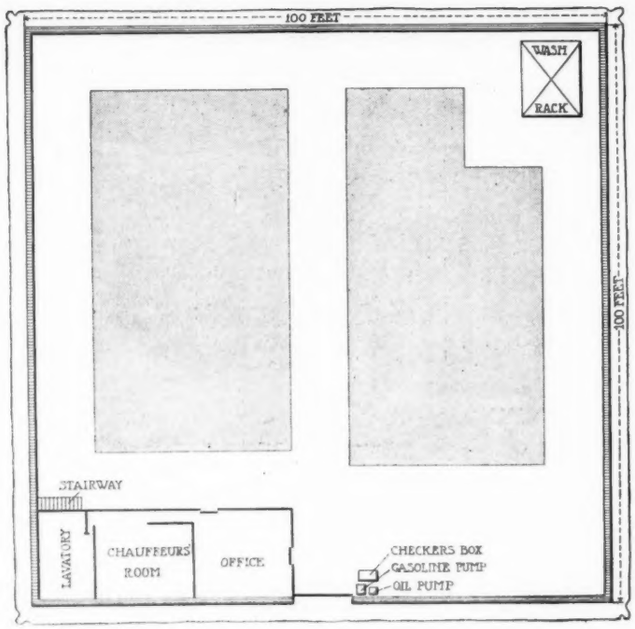


Fig. 3—Garage plan for a floor space 100 feet square

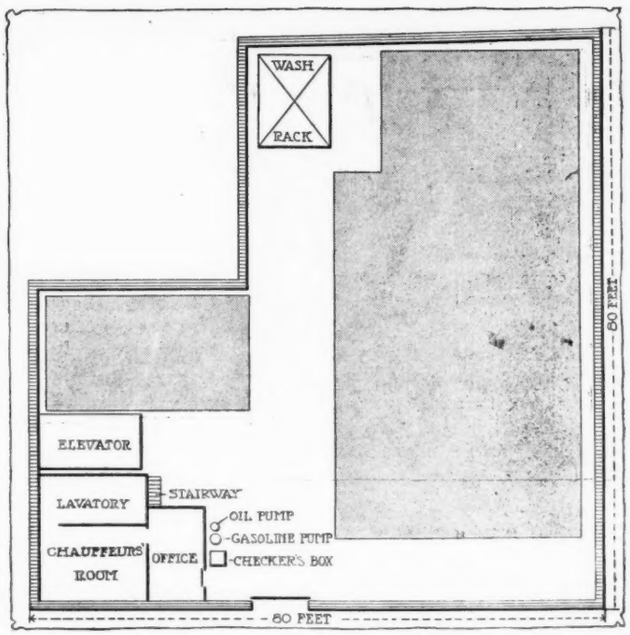


Fig. 4—How to utilize a lot having one corner occupied

the office is also shown. The office is 15 feet deep. At the other end of the garage there is a repair shop 30 by 15 feet, which is screened off the rest of the garage and contains the working benches, a small tool room and a few machine tools. Like the office, the repair shop is equipped with a number of windows, these being 3 feet wide so as to permit plenty of light to enter the shop. Next to the shop there is an emergency door opening into the space to the rear of the garage, and the other rear corner of the garage is filled out with a wash rack equipped with an overhead revolving washing outfit. The central section of the garage has not windows, but is lighted by three overhead skylights, each being 30 by 10 feet. Electric lights give illumination after sundown. The spaces filled by dotting indicate the storoge space for automobiles. This type of garage is advisable for operation in the country, and if it is desired to have a paint shop, a second story can be set upon either end of the building and an elevator be installed in any suitable spot in the garage.

Fig. 2 shows a layout for a garage covering a 50 by 100-foot lot with a 50-foot side facing the street. The same scheme as in Fig. 1 is used in regard to the entrances, but there is a wide passage from the main door of the garage office and store room to the interior of the garage proper, as this plan is designed for a garage, the owner of which also carries on an automobile agency and accessory store. Consequently the office is furnished in a different manner and its back portion is used for an accessory store and a storage room for tires and reserve parts for the cars handled. The garage proper contains a wash rack and the repair shop, located in the rear corners of the building. The door from the street to the store is wide enough for cars to pass through it, and an equally wide door is at the back of the store, leading into the garage interior. An emergency door at the rear of the garage is in line with these two doors. The center of the garage is illuminated in daytime by two large skylights, both running in the same direction as the garage itself. Excepting for the aisles leading from the entrance and exit to the garage center and a passage through the middle of the same, the floorspace is devoted to cars,, as indicated by dotting.

Fig. 3 shows a garage plan for a floor of 100 by 100 feet. This building is designed to be used as a garage only. Office, chauffeurs' room and lavatory are arranged in one corner of the building front, while in the other an elevator may be situated if a second story is necessary. In this case a repair and paint shop may be placed above the front part of the garage. The street door is in the center, and the office is entered from the passage leading from this door into the garage space. The cars are arranged in two blocks in the center of the garage, with wide aisles between and around them, allowing for easy moving of the vehicles. If no elevator is necessary a number of cars may be lined up along the entire front of the building, to the right of the door. Gasoline, oil and water pumps, as well as the checker's bunk, are located close to the door.

In case the garage is built on a space into which extends the corner of another lot or building, Fig. 4 shows the way to utilize such a shape of the lot. If the maximum dimension of the garage in both length and width is 80 feet the use of an upper floor will be necessary in almost every case, and office, chauffeurs' room and elevator may be arranged as here shown. Lettering indicates the position of the stairway. The washrack might be placed more advantageously than indicated here, depending on local circumstances. The shaded spaces show where the cars are stored, and wide aisles make moving them about in the garage easy.

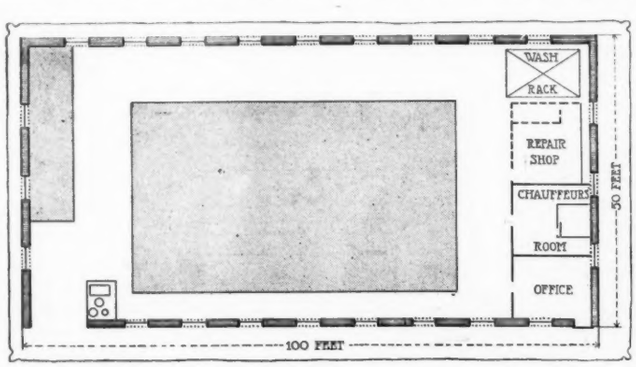


Fig. 5—Garage 50 feet wide with 100 feet on the street

A garage to be built on a 100 by 50-foot lot, with the longer side facing the street, is a problem entirely different from that solved in Fig. 1 for a lot of the same size. In the case shown in Fig. 5 a pleasing

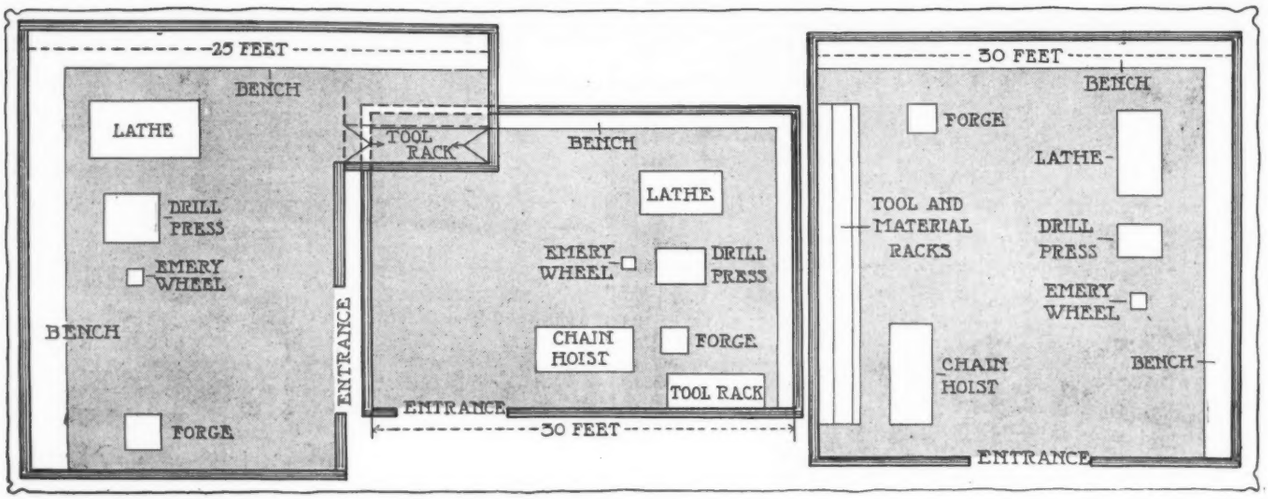


Fig. 6—Arrangement of the shop

Fig. 7—Another possible arrangement

Fig. 8—Arrangement for a square shop

and efficient arrangement may be had by placing the automobile door at one end of the building and the office with its small door on the other, the well-balanced effect of the front being obtained principally by the use of eight 3-foot windows. An auxiliary office near the car door accommodates the checker, who also superintends the sale of gasoline and oil. From the office a small door opens into the garage interior, as does one from the chauffeurs' room and repair shop, situated close to the office. The wash rack is in the right rear corner of the garage. All the cars are stored in the center of the floor, with a wide aisle surrounding the storage space; there is also room for several cars near the left side of the building, close to the window line. By the use of numerous 3-foot windows on all sides of the garage the interior is amply illuminated, and there is no need for a skylight.

The layout for a repair shop must also vary with the different spaces available for this end, and Figs. 6, 7 and 8 show proposed solutions of three different problems. In Fig. 6 the small extension of the shop at one corner is used to accommodate the tool room, containing perhaps a rack with tools and stock. The few machine tools needed, a lathe drill press, emery wheel and gas forge, may be arranged as here shown. The benches should be arranged, so far as possible, along the window lines, and to get as much light as possible in this way in daytime the shop should be always located in a corner of the garage. The entrance to the shop is wide, making possible the entering of a car. A chain hoist may be kept inside the shop or without, but if the width of the place is 25 feet the latter course would recommend itself, namely, to keep the chain hoist at a suitable place on the garage floor.

In Fig. 7 a 30 by 20-foot space is used for the repair shop. Slightly away from the bench the machine tools are arranged as indicated, and the entrance is so placed in a corner of the shop that an automobile may be made to enter it easily without interfering with the chain hoist kept close to the door. The tool rack is placed in a corner near the end of one of the benches.

Where a square space is available the most pleasing arrangement of all is possible, as shown in Fig. 8. The entrance is in the center of one side, and one bench is opposite it and one to the right—or the left, if the light comes from that side. On the opposite side may be accommodated even a long rack for tools and bar stock; perhaps even a small stock of repairs parts. The various machine tools take very little space and leave plenty of room in the center of the shop for a car or parts of cars.

It should be remembered that in every repair shop, while there should be no waste of space, there should be no cramping either, but a sufficient freedom of movement for workers and materials alike. All shops should be screened off from the rest of the garage.

Fig. 9 shows a proposed layout for a garage office. Opposite the street door the roll top deck of the manager should be placed, and next to it could be stationed a small desk for typewriter. Two chairs should be in front of the manager's desk. A bench or sofa should be placed in the center of the front side of the room, with a table before it. Opposite these pieces the safe and a number of filing cabinets might find space. A small door opens into the garage interior. If desired, an office door of the swinging type may be placed in front of the manager's desk to separate the office from the space directly in front of the door.

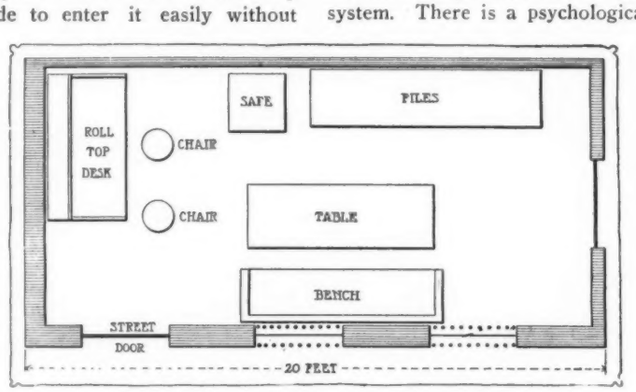


Fig. 9—Proposed layout for a garage office

Filling Out Elaborate System Form

Some of the systems now in use in different machine shops require a man whose penmanship is extremely limited to fill out complicated forms. While these forms no doubt give accurate cost data, it is very much to be doubted if the results justified the expenditure of time on the part of the workmen in filling out the form. The man who is disturbed at his regular work to fill out system blanks becomes discontented and forms in his mind a contempt for the administration which compels him to forsake his duties as a machinist, foundryman or similar occupation to take up the unfamiliar task of puzzling over a blank which is far more complicated than an ordinary double entry bookkeeping system. There is a psychological condition in the mind of the average workman which induces him to attempt to deceive a system with which he does not agree and it has often been the experience of production managers that men will become deliberately "pig-headed" and refuse to use their reason in filling out the blanks, often putting down incorrect data when fully aware of what should be set down. They take this means of showing their disapproval of a time-killing rather than a cost-cutting system.

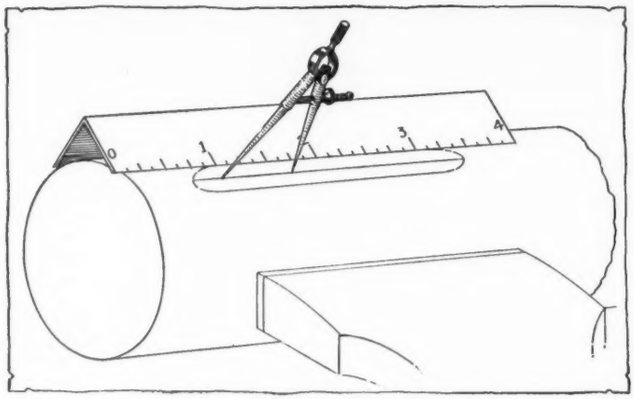


Fig. 8—Rapid method of laying out keyway on shaft

Keys and Keyways for Automobiles

Owner May Cut His Own Keys in a Satisfactory Manner with Primitive Methods

Part II

CUTTING a keyway by hand in a 2-inch shaft is a job which sometimes must be done in a primitive way and for the present illustration, we are assuming that the only power tool available is a drill.

A 2-inch shaft will have a keyway, as per the formula given for Fig. 1, width 5-8 inch, length 2 1-2 inches and depth 5/32 inch, and having determined the location on the shaft of the hub of the part to be keyed, we proceed to mark off the shape of the keyway as a guide to machining and a key seating rule, Fig. 8, will be found useful for this work. Mark with a scriber two lines 5/8 inch apart and parallel with the center line. Next mark off the drilling centers, the length of the keyway is the length of the hub, or 2½ inches, and as the width is 5/8 inch, the end holes will be one-half this, or 5/16 inch in from each end. This will establish the end holes. Next with dividers, as illustrated, the space between is divided into three equal parts, and this will give two more drill centres or four in all. This done, drill with a 5/8-inch drill at each centre found, to a depth of one-half the thickness of the key or 5/32 inch. This will cut away all the stock that a drill can be used for, and then proceed to clean up between the holes with hand drifts. Fig. 9 shows the different sizes of drifts required to do this work.

The cutting away of the stock, Fig. 9-A, between the holes, is proceeding and the narrowest drift is being used to start the work; this is carried through from hole to hole and the operation is repeated with a larger drift each time, until the job is completed with the largest, which is just the size of the hole, or 5/8 inch thick. With this latter tool the motion is more upright as the work proceeds and for the final it is driven straight down and this last operation cleans the groove between the end holes.

Drifts Have Many Uses

Drifts for doing the keyway cutting are useful for a variety of purposes and every repair man knows their value. The operation of making them is quite simple. It is as follows: Select commercial drill rod of the right size and cut off the right length for handling (about 5 inches long will suit most mechanics), then flatten on two sides as illustrated Fig. 9H and leave a little stock for grinding. When grinding the sides and end care must be given to have perfectly flat surfaces and square, sharp corners, otherwise their cutting value is lessened.

The hardening process is as follows: First, heat slowly to a cherry red, then plunge in oil, moving it slowly about in the oil until thoroughly cooled; this is important, as it prevents them cracking when being tempered. This latter operation consists of first brightening the sides with emery cloth, then return to the fire and slowly heat until a straw color appears, then dip in water until cool, then finish-grind to size.

In making keys the first shown is the flat sunken key and for example a key will be made for the keyway just cut on the

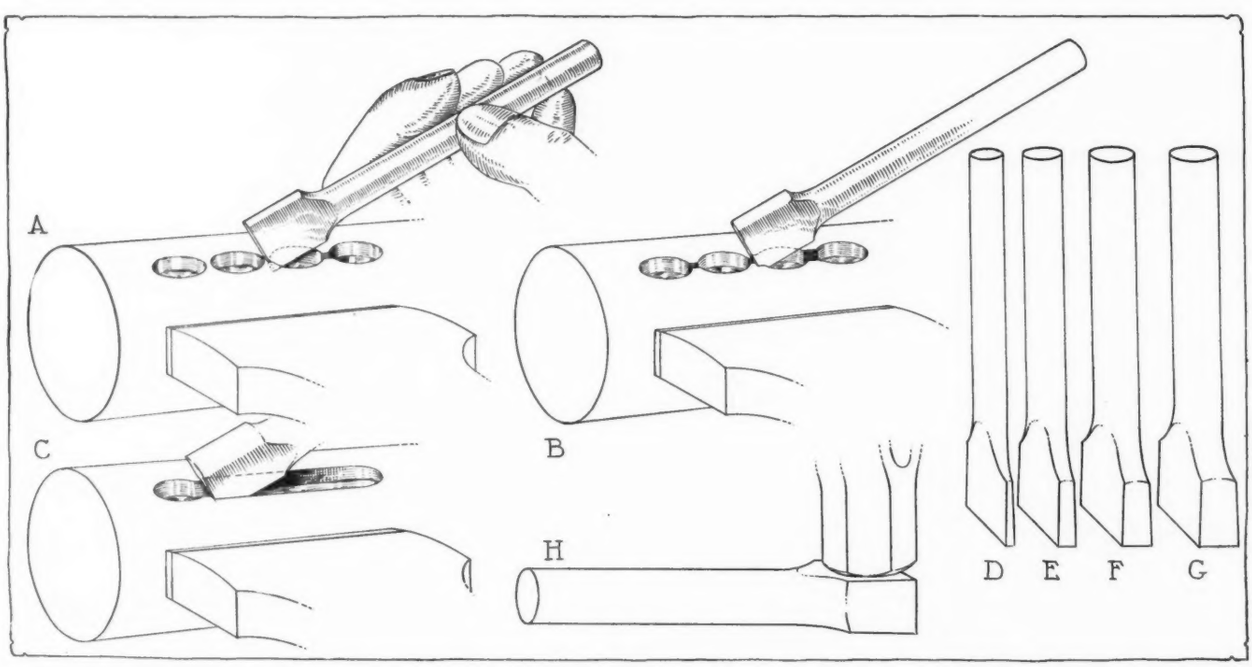


Fig. 9—Illustrating stages in the cutting of the keyway, how the drifts for cutting it are used, how drifts are made and the different styles of drifts needed

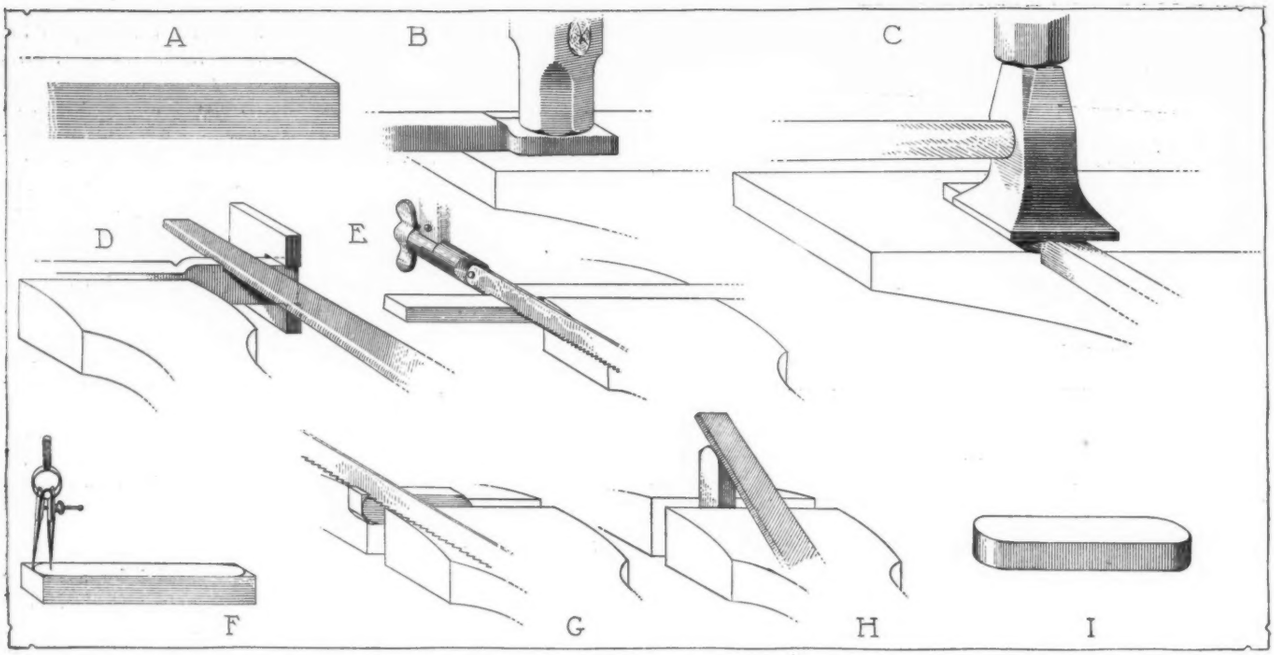


Fig. 10—Illustrating how a flat sunken key is manufactured from a piece of 5-inch square crude steel A. The different letters indicate the successive stages in the operation

shaft, Fig. 9C. The size of this key must be 5/8 inch wide by 5/16 inch thick, and assume that there is not on hand stock of just this size, so the key will have to be made from a piece of ½ inch square. Tool steel is the material for making keys, and Fig. 10A is of a piece of ½-inch square tool steel. To make this over it is first heated to a bright cherry red and then to flatten on an anvil, as shown at B and C, leaving about 1/32 inch full.

Method of Filing Explained

The next operation is to file to dimensions as at D, using a gauge to test the size. E shows the cutting off preparatory to marking the ends.

A good plan to follow when filing the key to size and one that will help, because it will save time trying the gauge so many times on the piece, is to file finish the base of the key stock and then one of the sides, then coat these surfaces with copper sulphate. This will give the metal a bright copper surface on which the width and thickness of the key can be marked with a scriber and the rounded edges are marked off at the same time.

The above-mentioned solution is made from the following mixings:

1 ounce copper sulphate
4 ounces water
1 teaspoonful nitric acid.

At F is shown the method of marking the ends with a pair of dividers. G shows the corners being sawed off; H the operation of filing to a scratch line and I the finished key. It is necessary that the key made in this way should be left a shade full and fitted to the keyway by the use of a scraper. The use of the copper sulphate coating will be found useful when fitting also.

Having completed the fitting operation, the next and final step is to heat treat the key; this is similar to that explained for the drifts. First, heat slowly to a cherry red; second, plunge in oil and move slowly about until cool; third, brighten the sides with emery cloth; fourth, heat slowly till the color changes from a dark straw color to a purple, and fifth, dip in water to cool.

In making a Woodruff key, first select a size of key that we are to make as an example, and the letter F from the standard tables—Fig. 3 (in last week's issue)—is one that we have already become familiar with. The size of this key, as given in the tables is, radius 11/16 inch, thickness 3/8 inch, and the stock needed is 1 3/8-inch round tool steel, or cold-rolled steel can be used by giving it a different heat treatment. One and three-eighth-inch diameter is 11/16-inch radius, therefore this bar will form the outside or radius shape of the key, and Fig. 11A and B shows the operation of cutting the key stock from the bar with a hack saw. C shows the piece ready for filing. This is the time to call attention to the fact that the size of the standard Woodruff key provides for two keys being made from one cut across of the bar stock. At A the saw is in the centre of the bar and this cut forms the diameter face of two keys, there being an allowance of 19/32 inch for sawing and cleaning up the two faces, hence on C the part left on the bar is the making of another key of the same size as that cut off. At E is shown the operation of filing flat the face of the key and it is kept at right angles to the outside or circular face. These surfaces are next treated with the copper sulphate and the size of the other two surfaces is marked and the key filed to the scratch line. This is shown at D and F. The same rule will hold for this

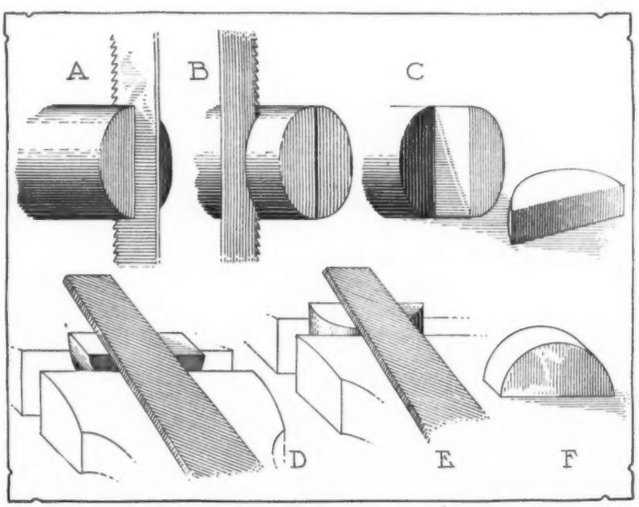


Fig. 11—Illustrating the manufacture of a Woodruff key from 1 3/8-inch round crude steel bar. The letters show successive stages in the manufacture

one as for the sunken key of leaving the stock a trifle full and scraping to fit.

To heat treat this key, proceed in the same as for the sunken key for tool steel and for cold rolled stock, the treatment is as follows: First, heat to a cherry red; second, rub with cyanide of potassium; third, reheat to a cherry red; fourth, rub again with cyanide of potassium, and fifth, plunge quickly in water. The amount of cyanide of potassium needed for a job of this kind can be bought from any drug store for 5 cents.

Making the Round Taper Pin

The final operation of key making to be described is the round taper pin, and we select as an example for illustration the one that was used for illustration in Part 1, the No. 6 from the standard tables. The mean diameter of this pin is .310 and the length will be 2½ inches. We select for the stock a piece of drill rod 11/32 inch in diameter and mark off a line 2½ inches from the end, this being the length of the finished pin. On one end we scribe with a compass a circle ¼ inch in diameter, Fig. 12A. Fig. 12B shows the rod being filed square, beginning with the circle size at one end and tapered to nothing 2½ inches back. C shows the operation completed on the square; D and E shows the bar made eight-sided in the same manner; F shows the operation of rounding the bar; G shows this operation completed; H shows the pin being tested in a gauge and at this operation the pin is coated with copper sulphate, as before spoken of, as this will help to locate the spots where the pin rubs in the gauge. I shows the pin being cut off and J shows the finished article. No heat treatment is needed for this pin.

The methods outlined for the different operations here described represent not the writer's opinion or suggestion as the way that such a job would be undertaken under ordinary conditions or surroundings, but they show in a practical and sensible manner a way of making a key or cutting a keyway and doing a good workmanlike job, even when the facilities at hand are the crudest that will be met with when touring.

The ability to overcome difficulties is what distinguishes one man from another, and for the car owner that takes a personal interest in the repairs, the above knowledge will put him in position to instruct a very crude mechanic sufficiently to enable him to make repairs of the nature described.

Replacing the Cotter Pin

The cotter pin is an item which is gradually disappearing from the car's anatomy. Although not nearly as safe a means of locking a nut, the substitution of the spring washer for the cotter pin is welcomed, not on account of the spring washer possessing any peculiar virtues, but because the cotter pin is a source of nuisance when dismantling and erecting. Half the trouble with the cotter pin, however, is brought about by its being used in connection with motor-cars in a manner that is not to be seen in any other branch of engineering. In a garage recently we noticed a man, who doubtless called himself a skilled mechanic, laboriously replacing cotter pins as if the nuts he was thus securing would never have to be removed during the rest of the car's existence. Instead of opening the legs of the pin just sufficiently to prevent it shaking out, each leg was bent around the nut, making its removal when necessary a heart-breaking job, because after the legs have been unwrapped from around the nut it will not pull through the hole easily, having far too many kinks and bends to be pulled straight through and required a great deal of work to straighten.

If the legs had only been opened a few degrees they could be closed up again with pliers in less time than it takes to tell it, and drawn out, while the nut would have been held just as securely in position. A further point to observe is that the legs are not longer than necessary; a projection of an ⅛ inch to ¼ inch beyond the nut is ample. If this rule be acted upon a tight pin can be tapped out far enough for the head to be gripped by the pliers.—From *The Car*.

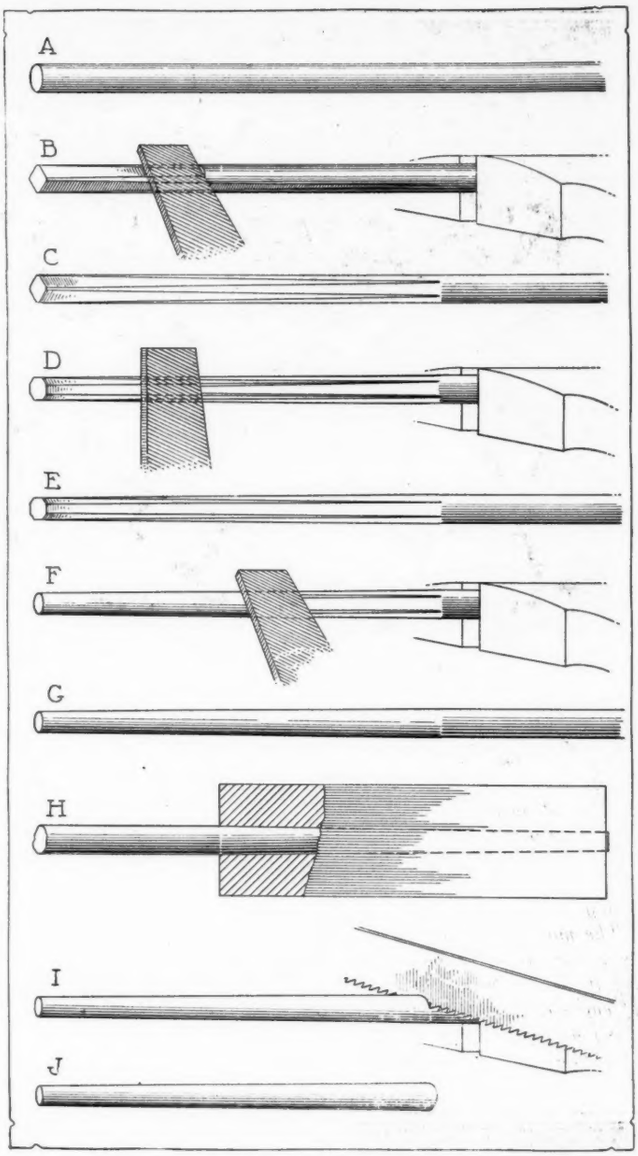


Fig. 12—Illustrating the manufacture of a round tapered pin from a piece of drill rod 11/32 inch in diameter. The letters show the successive stages in filing this rod, first to a square, then to an octagon, and lastly to the required rounded form

Filing a Piece in a Lathe

When taking off metal from a piece revolving in a lathe by the use of a file held against the work, the inexperienced shopman will often make the mistake of not giving a uniform longitudinal feed to the file. No one with any experience at all will make the mistake of applying the file too heavily to the revolving work, but many make the other mistake which is just as serious.

The file should be held lightly against the piece at the point where it passes into the chuck and then moved with a slow regular motion from left to right. This will produce the best results as far as the surface is concerned and for a piece of metal which must of necessity have the same gauge throughout its entire length, it is the only proper method of procedure.

In finishing such a piece with fine emery the exact same method must be pursued. The emery is laid at right angles to the revolving piece and is moved in the same manner as was the file, the resulting surface will be the smoothest obtainable and will be far more regular than if the emery were held in one spot for an appreciable length of time and then moved to the next point. The microscopic nature of the surface produced by removing the metal in this manner will be a very fine screw thread, the lines produced by the cutting surface of the emery will wrap themselves in regular spirals about the stock.

Testing a Federal Motor Truck

Bound for home after a day's outing in the country. Federal testers 20 miles from Detroit

WHEN we in the big, luxurious automobile whisk by the heavily laden motor truck which is carrying three times as much as the finest team of horses in the world ever could pull, we think of this truck only as a symbol of the advancement of commercialism, never stopping to consider that it is the first cousin to the motor car, and that as much thought and care has been expended upon its design and construction as was given to the very automobile in which we are riding.

The motor truck of today is a success and it is being adopted by conservative business by leaps and bounds. And in attaining its position, the truck has exacted the services of the best of engineers, has demanded the best of machinery, and, its parts being assembled into an efficient and serviceable whole, it has been given just as extensive a road test as is meted out to the passenger vehicle before its maker will risk his reputation with it in the hands of the business man.

The new motor truck, after it leaves the assembly department of the Federal Motor Truck Co., Detroit, maker of commercial vehicles exclusively, is transferred to the test department. It is now "in for" from 15 to 20 hours of road work over poor stretches, sandy places, hills and other obstacles before it can hope to receive the final inspector's O.K.

The initial step in a new Federal's test is the starting and adjustment of the motor. After the propelling unit has performed to the satisfaction of the department a 2250-pound cast-iron block is hoisted upon the chassis. This forms the load and corresponds to placing the machine under service conditions. Throughout the entire test which ensues this weight is a constant companion of the truck. Up over mud and clay hills, down dales,

Negotiating a sand hill at 15 miles an hour, a part of the road test exacted of Federals

Some of the mud encountered by a Federal truck on a 6-mile stretch of almost impossible country roads

through winding narrow ribbons of road the iron block passenger must be carried.

The trucks are kept upon the road until the motor and every bit of the mechanism works satisfactorily. Any difficulties which are discovered while on the truck's first tour are taken care of when the machine gets back to the factory.

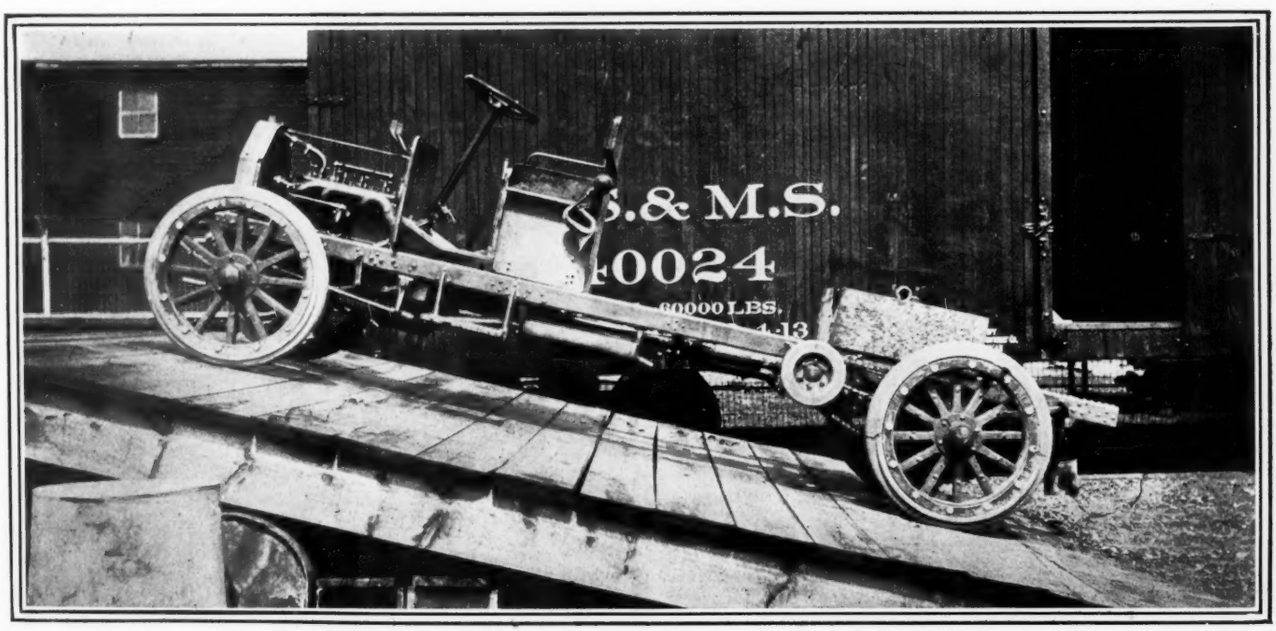
The Federal testers follow a regular course which takes in all sorts of road surfaces. Though some of the country traversed is very picturesque, it would not be thought of by the average motorist, due to the bad roads.

In the accompanying illustrations the tester and his machine are shown starting on a long run, which usually averages several hours. The test cars go out in pairs to assist one another in getting out of bad holes or other difficulties. The trucks are later seen negotiating a 6-mile stretch of almost impossible country roads. The mud is much in evidence.

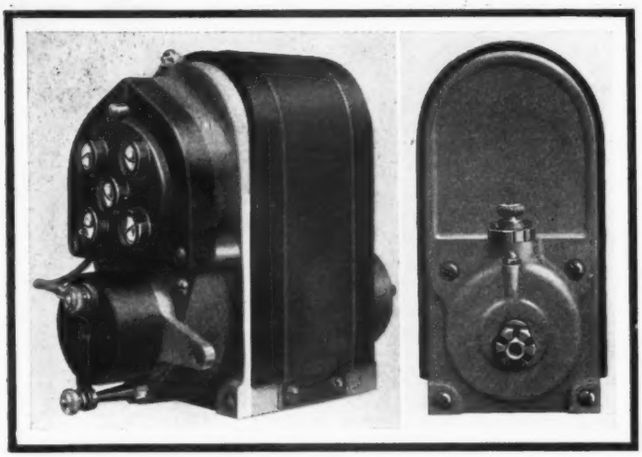
Later a Federal is seen in the act of getting a start before ascending a 12 per cent. grade. Sand hills are not to be ridiculed, for they have given many a motorist trouble, and the truck must pass over them. Fig. 4 shows a truck going up a sandy incline on high speed at the rate of 15 miles an hour.

After all its trials of the day on the road the Federal's homeward course lies through a picturesque country, as seen in the opening illustration. This view was taken 20 miles from the factory.

The outing over, the truck is run up on a 20 per cent. incline with the 2250-pound weight still in place. The brakes are set and the machine must remain stationary.



After their road test the trucks are run up on this 20 per cent. grade and the brakes set



External views of Remy Model P magneto

Remy Brings Out New Watertight Magneto

Latest Model Is Fitted with Timing Button for Easy Setting

A NEW magneto to be known as Model P is announced by the Remy Electric Company of Anderson, Ind. This new instrument, external views of which are shown in Fig. 1, is of the wire-wound armature type producing a dynamic spark of great intensity with a distinct flame characteristic.

A special feature is that the new magneto is entirely water and dust proof. In order to accomplish this the end-bearing plates are machined to fit the magnet; the distributer is machined to fit the gearcase and packing is used in all joints to render them perfectly tight. The distributer terminals, which are of the external type, as shown in Fig. 2, are also of water-proof design and provide a quick and reliable means of securing the high tension tables. The circuit-breaker is thoroughly protected by a cover of Bakelite, a heat-resisting material of high di-electric strength which possesses points of superiority over hard rubber or composition material, since it is stronger, higher heat-resisting and will not warp or crack and is non-hygroscopic.

Hard bronze is used for the armature heads. A very strong connection between the driveshaft and the armature head is made by casting the high grade steel of the former into the latter. The coupling end of the driveshaft is tapered, keywayed and threaded to S. A. E. standards. The complete armature is shown in Fig. 2.

Armature Bearings Are Dust Proof

The armature winding is of cotton-covered enameled wire heavily impregnated with Bakelite, rendering it impervious to heat and moisture. The armature shaft revolves on special magneto type ball-bearings, which are made dust proof by the use of felt washers.

Considerable improvement has been made in the design of the circuit-breaker, by which it is claimed to be exceedingly fast and positive in action. The entire circuit-breaker may be readily removed for inspection without the aid of tools. The design is such that adjustments are unnecessary under normal running conditions. The circuit breaker cam is made of the finest chrome nickel steel, hardened in pyrometer-equipped furnaces, ground to size and accurately tested for synchronism.

The timing control lever may be attached to either side of the B. P. magneto, as the circuit breaker and housing is reversable. An ample timing range of 35 degrees is provided.

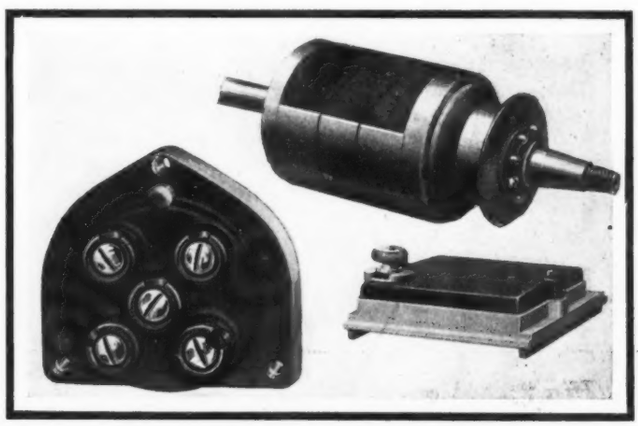
The water-proof distributer is of Bakelite. The terminals for the spark plug cables are located on the face of the distributer, Fig. 2. These also are made of Bakelite and of such design as to make the connections water-proof. An ingenious device, known as the timing button, is incorporated in the distributer, for the purpose of timing the magneto to the motor. This button is visible in the view of the distributer, Fig. 2, immediately above the five terminals. By pressing it against the action of a small spring at the back a plunger is forced up against the face of the timing gear, which is then turned until a recess provided to receive the button coincides with it. The circuit breaker is then in the proper working position, and as the terminals are also correctly located at the same time the usually difficult operation of proper magneto timing is considerably simplified.

The distributer gears are very accurately cut, 24 pitch teeth being used. The large gear is of bronze and the small gear of cloth and steel insuring quietness of running.

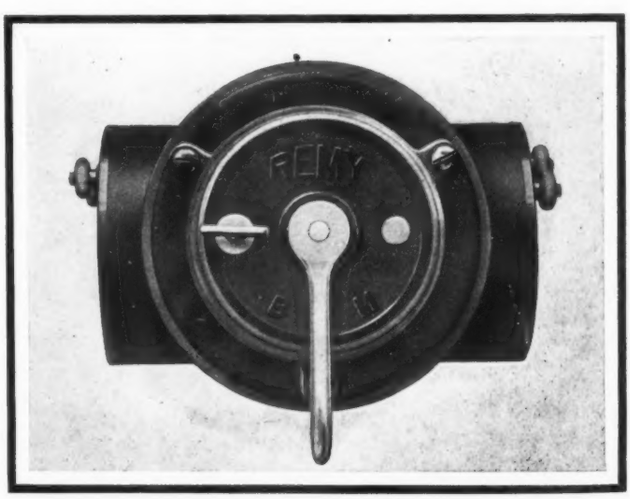
The condenser and case, shown detached from the magneto in Fig. 2 at the right, also form the top plate over the armature.

The Model P coil, Fig. 3, to be used with the above instrument, is claimed to be more efficient than the coils heretofore produced. The switch is built integral with the coil and also forms a method of attaching to the dash, as will be seen in the illustration. Only the switch face appears on the driver's side of the dash. The switch has three positions, Battery, Off, and Magneto, and is fitted with a locking device.

The coil is wound with cotton-covered enameled wire, heavily insulated by the use of a number of Bakelite pieces.



Distributer, armature, and condenser of the new Remy magneto



Remy combined switch and coil for mounting on dash

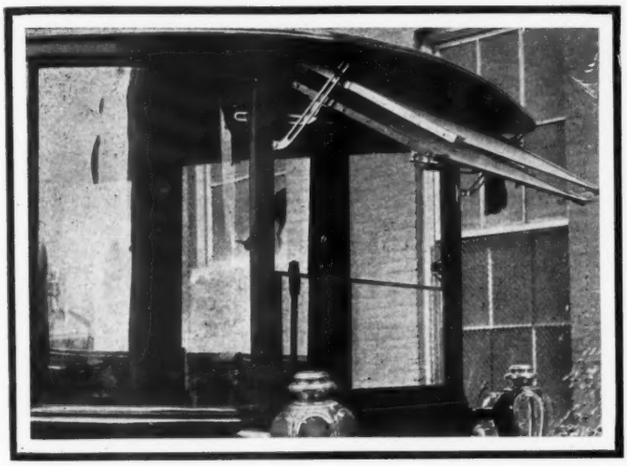


Fig. 1—Hanlon double-glass window on 1914 Detroit electrics

Detroit Electrics Adopt Worm Drive

Hanlon Double-Glass Window Fitted as Standard on 1914 Models

DETROIT electrics, manufactured by the Anderson Electric Car Co., will have worm driven rear axles for 1914. After several years' experimentation, the concern has adopted the Lanchester-Daimler type of gearing with the worm mounted below the ring gear, as shown in the phantom diagram, Fig. 3. This type of gearing was first used by the Daimler Co. in England.

The Lanchester worm is not a straight type, but is of the hourglass design, being formed so as to partially embrace the circumference of the worm wheel. The teeth of the wheel are also concaved to conform to the threads of the worm. Three teeth of the latter always share the load simultaneously, which is an evident advantage over bevel gearing in which only one tooth takes all the load in transmitting power.

The question of proper lubrication has a very important bearing on the subject of worm drives, and in placing the worm below the wheel, the Anderson Company believes that it has insured perfect and positive lubrication. In its position, the worm runs constantly in a bath of oil. Suitable annular and thrust bearings are provided, the fact that end thrust is much greater in a worm-driven than in a bevel-driven rear axle being recognized in the special thrust bearings. The ring gear and worm, together with the differential and necessary bearings, may be taken out as a unit.

Double-Glass Window Provides Clear View

The manufacturer having secured patent rights of the Hanlon car window, this is to form part of the equipment of all the 1914 Detroit electrics.

As shown, Fig. 1, this new window consists of two upper glass panels, one outside the other, and both hinged at the top. These may be fixed in any desired position by the hand clamp brackets on the sides. The inner glass may be adjusted from within the car. When protection against rain, snow or dust is desired, the inner glass can be lowered, but this does not become blurred, the because the outer glass is still in tilted position to catch the snow or rain drops and keep them from the inner glass. In no event is the driver's view of the road obstructed by the glass panels, for his line of vision comes below their lower edges when either the outer alone or both are in tilted position as seen in the illustration, which opens up the front of the car in the usual way. When the protecting window is brought all the way down, it keeps the regular front window from frosting in the winter time.

Signet Is a Real Cyclecar

IN Fenton, Mich., within 50 miles of Detroit, another concern has been carefully and cautiously working out the details of a cyclecar which it is now about to introduce to the public at a figure under $400. This is the Fenton Engineering Co., and its little machine, which is to be known as the Signet, is a true cyclecar.

As illustrated, Fig. 2, the car is equipped with a V-radiator, back of which is a De Luxe standard 9-horsepower, air-cooled motor having a bore of 3 5-8 inches. This motor is a standard type made for cyclecar purposes by an Indianapolis concern.

The car has a friction transmission and drives by V-belts of imported rubber which have a width of 1 1-8 inches. There is no differential of any kind, the slippage of the belts taking care of any difference in the rotative speed of the wheels in rounding corners and the like. The forward belt pulley has a diameter of 8 inches and the rear 17 1-2 inches.

The Signet has cantilever spring suspension, the front springs being half a length and fastening to the frame at their ends, while the rear are full half elliptics to give a double cantilever action.

The control is standard with spark and throttle levers on the steering column and brake and clutch pedals. Electric lamps are included, being run by storage battery.

The body is a two-passenger affair for side by side seating. Back of the seat there is a platform for luggage. The streamline effect is carried out, terminating at the pointed radiator. The wheelbase is 96 inches, while the tread is 36 inches.

The little car weighs 475 pounds complete, its overall width outside of the fenders is 45 inches, while the seat length is 38 inches. Wire wheels are used.

The Fenton Engineering Co. is not to market the car directly, though the same capital, all of which is local to Fenton, is back of the project. It is probable that the name of the Signet's maker will be the Signet Cyclecar Co., though this has not been definitely decided upon. It is planned to make about 100 cars the balance of this year, more than this number being already contracted for, it is said. Next year's manufacturing plans have not yet been decided upon.

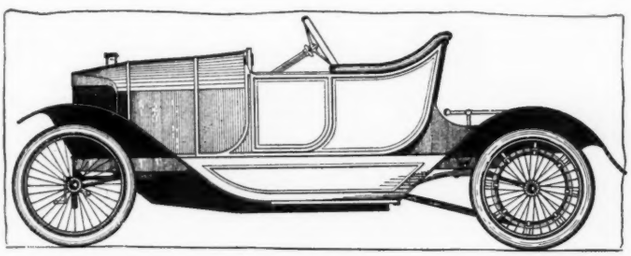


Fig. 2—Nine-horsepower, two-passenger, belt-driven Signet cyclecar

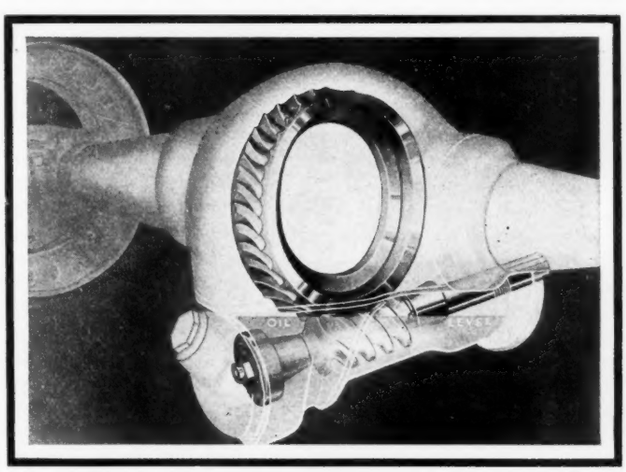
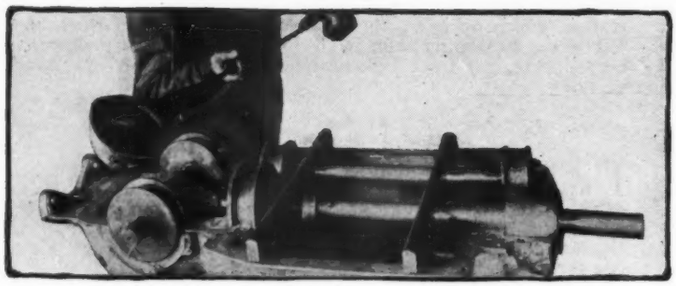


Fig. 3—Lanchester-Daimler worm drive as fitted to Detroit electrics



The Rostrum

Moisture Affects Running of the Motor

EDITOR THE AUTOMOBILE:—Mr. Chase's article on power affected by atmosphere is not totally correct according to my experience. In fact, I believe Mr. Chase is in the dark on the matter in spite of his wide scientific as well as practical knowledge. It would be a great pleasure for me to have him sit at my left in a 1912 Cadillac and demonstrate to him the astonishing difference there is in my car on the road to my garage, a stretch of road about 1 mile long that is shaded by tall trees and with water nearby. The temperature there is always several degrees lower. After traveling about one-quarter of the distance I feel my car has more power and runs smoother on the last part of the road. To ascertain if this were true, on different occasions, long before reaching that space, I have opened the throttle on the sector to make sure of giving the same amount of gas to the engine. The results are surprising.

Furthermore, from the residence to the gates there is a fairly sharp turn with an incline of several degrees. I also tested the car on this stretch and the difference is so great that one day my mistress asked me what I did to the car that at times it runs so quietly and seems to climb hills so much easier that it feels as if it had additional power.

After such trials as these I have come to the conclusion that the mixture was affected by the moisture in the air, for I don't think the engine could be cooled enough in that distance to show such a change. I have had in mind for a long time the idea of making some kind of a generator, for example, where I would have to put some water with ice in it in the upper part with an atomizing arrangement, atomizing the water very gradually on a sponge or something more appropriate for carrying out the idea with an air intake. The air should be sucked through the sponge, making it acquire a limited moisture, such as found in the air on such instances as mentioned above. Then it should be conveyed to the mixing chamber of the carbureter.

It is my opinion that it would not only give such results as mentioned above but would serve as a decarbonizer, as every one knows that steam removes carbon.

Now, Editor as well as readers, I wish your opinion. As a rule, we chauffeurs are supposed to be ignorant and we do not dare to step forward and talk on such subjects. We generally leave the task to the men who have prepared themselves by going through universities and who have spent time solving other problems.

Providence, R. I. F. R.

¶ *Perhaps many motor car owners and drivers have noticed a marked difference in the performance of their cars at night. Some claim that this is all imagination and that the sensation of speed is greater at night than in the day time. What is your opinion on this?*

¶ *Many car owners have experimented with water and found that by introducing a small amount into the intake pipe a marked increase in mileage for a gallon of gasoline is noticeable. One man has increased his mileage from 18 miles per gallon to 24. Have you done any experimenting on this?*

¶ *Regarding water as a decarbonizing agent, it is a fact that steam passed over glowing carbon will combine with it and form the gas known as carbon dioxide, but does such a condition work out within the cylinder while the car is running?*

Force Feed Pump Design of the Ordinary Gear Type Explained

Editor THE AUTOMOBILE:—Kindly let me know the correct design of gear pumps for force-feed oiling systems.

Lakewood, Ohio. F. A. R.

—The gear pump consists of a casing inclosing two tightly meshing gears. One of these gears is driven by the pump shaft and the other is an idler working upon a shaft which is a part of the casing. The oil is carried around through the casing from the inlet side to the delivery side by the teeth of the gears. The oil enters the housing on the side toward which the meshing sides of the gears are moving. The oil is picked up on the teeth of the gears as they come around and carried to the other side of the casing, where it is forced through the opening or outlet. A typical oil pump of the gear type is illustrated in Fig. 1. In order to prevent leakage of the oil around the pump shaft a stuffing box is fitted at this point. The gear pump is mounted so that the intake is part of the oil reservoir and on most motors where it is used the pump shaft receives its motion from the camshaft.

Has Suggestions on Cause of Miss and Collection of Oil in Cylinder

Editor THE AUTOMOBILE:—Referring to an inquiry in the Rostrum under date of August 14 from a party who had been troubled with a persistent miss I wish to offer a few suggestions that may solve the problem.

First of all, the spark-plug points were always found covered with oil, and this condition prevailed even after cutting down the oil supply, installing new cylinder and piston rings and finally a new piston and additional rings. It surely is not reasonable to presume that after all these changes that the supposed trouble should be the leakage of oil into the explosion chamber. If this had been the trouble the replacing of the cylinder, piston and rings would have given a decidedly noticeable relief. As the relief that was obtained was of short duration and intermittent it would only be natural to look elsewhere for the trouble. We all know that when a cylinder fails to fire, a certain amount of oil collects in the explosion chamber and with each successive miss of that cylinder this accumulation becomes greater. This is exactly what happened in the case in question.

This surplus oil was not so much the cause as it was a result of this continual failure of the spark. The fact that his motor usually began to miss on closing down leads to the conclusion that the trouble must have been either in the magneto or wiring of that cylinder or a leakage of air around intake manifold, thereby giving a mixture too weak to be fired at the slower speeds. He also said that the compression was good and that when the motor was firing regularly it had plenty of power, indicating that the trouble might easily be sticking valves. This would, of course, be the case after the motor had begun to heat up and would be noticeable on slowing down.

I take exception to your suggestion that, provided the sparkplugs are carefully cleaned and on removing after motor begins to miss they are found carboned, it is a sign of too much oil.

Provided one has a good spark and the right mixture, an accumulation of oil in the explosion chamber will not prevent the proper working of that cylinder. I have personally driven with the plugs covered with oil and carbon, but only because the spark was perfect. In this connection I wish to call your attention to the fact that motors under the heavy stresses of the factory test and road racing are continually running with a big surplus of oil. E. T. NOBLE.

East Orange, N. J.

Motor Braking Strains Low Gears

Editor THE AUTOMOBILE:—1—I have been told on some authority that to coast down hill on low speed gear puts unnecessary strain on the car. If it does please give reasons why.

2—In ordinary service, what part or parts of a car is subject to most wear, excluding the tires? E. M. BLACKSHER.

Brewton, Ala.

1—It is true that coasting down hill on low speed with the clutch in puts considerable strain on the gears, although it is very far from being serious any more than it would be considered serious to climb an exceptionally steep hill on low gear. The reason for the added wear is that the pressure between the teeth of the gears is high because instead of reducing the motion transmitted through the gears the motion is magnified. When energy is stepped up in this manner through intermediate gears the inter-tooth friction becomes very high and this is the reason for the wear on the gears.

2—The parts which are under the greatest wear, excluding the tires, are the gears in the gearset and rear axle, the main and connecting rod bearings and the steering bearings and connections.

Motor Has Developed a Knock

Editor THE AUTOMOBILE:—I have a Standard Brush 1912 model which I have been using about one year. During this time I suppose I have run it 2,500 miles. It pulls as good as new, and the tires I have on the machine are not more than half worn. It has accumulated a knock in the motor which the mechanic is unable to eliminate. The crankshaft seems to be in perfect condition, and is tight in the bearings. Flywheel is tight. The trouble seems to be all in the timer gear. We thought if we would put new cam gear and shaft, new cam roller, and new cam roller brackets, both exhaust and intake, that it would stop the knock, but has failed to do so. The cam gear wheel was worn some, also the cog wheel on the crankshaft was worn just a little. It knocks very little when in high gear going at the rate of 5 to 7 miles per hour, but when going from 10 to 15 miles, it knocks awfully bad. Knocks all the time in low gear, unless the motor is cut down to exceedingly low speed. The car has good care, and with the exception of this knock is in perfect condition. If you can give me any information, it will be greatly appreciated.

Crowell, Texas. H. SCHINDLER.

—The probabilities are that the knock is due to play in the timing gears. In that case the only method of curing the trouble would be to replace the worn gears. When play develops the teeth of the gear will knock together at every change of speed and this knock becomes very audible after the wear has gone very far. In some makes of cars the designers make oversize gears which are fitted when the gears become worn and thus take up the play at this point. On the Brush car the only cure for the trouble would be in securing new gears.

Oil Leaks Around Valve Tappets

Editor THE AUTOMOBILE:—I have a two-speed 1911 Flanders 20. The oil in the crankcase forces its way up through the valve lifts and keeps the motor covered with oil on the outside. The lifts are a fairly good fit, and I went so far as to bore and tap the metal around them and place a stuffing box on each lift. This did not seem to do one bit of good. It might be possible that too much oil gets into the crankcase, with the type of oiler used on this model. There is no way to adjust it for more or less oil. Is there any way of remedying this? A SUBSCRIBER.

Jamaica, N. Y.

—Your trouble seems to be due to either of two conditions or a combination of both. There is a chance that the valve tappets bushings are worn and that there is too much oil working its way into the crankcase.

Regarding the first premise, the stuffing box which you fitted would seem to be the proper cure if correctly applied. If you will apply a felt packing arranged in such a way that you can tighten up on it sufficiently to jam the felt tightly around the tappet rod this will stop the oil working its way freely around the bushings.

If there is too much oil in the crankcase it is due to a leak in your oiling system. On this car a system known as the vacuum feed was employed and should there be any leakage of air into the oil tank on the crankcase side there will be a corresponding flow of oil into the crankcase. The valve at the top of the oil box must be tight enough to prevent any leakage of air. There is a slight possibility of the standpipe in the crankcase being too high. The oil level rises until it covers the top of the standpipe. As soon as it is covered the oil flow from the oil reservoir ceases. Should this be too high the oil level will naturally be so deep that the scoops on the connecting-rods will point too deeply and throw an unusual amount of oil around the crankcase. This

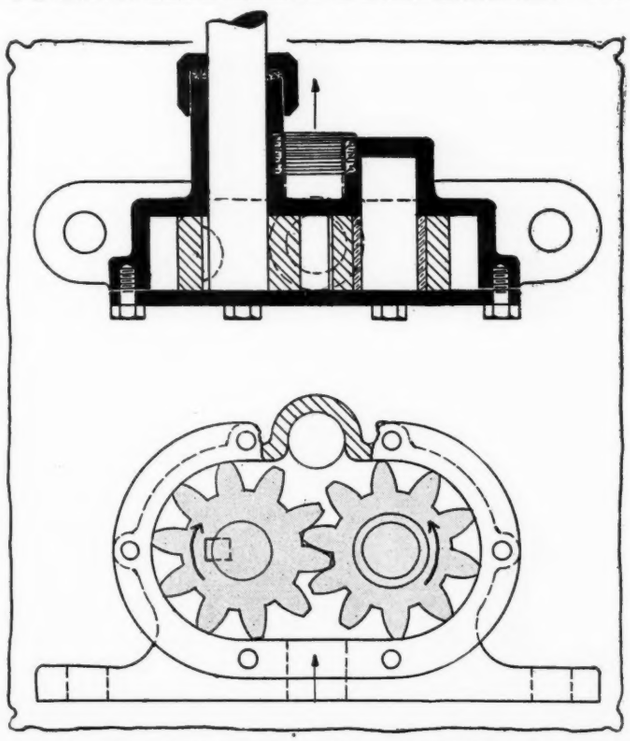


Fig. 1—Plan and elevational section of conventional gear pump

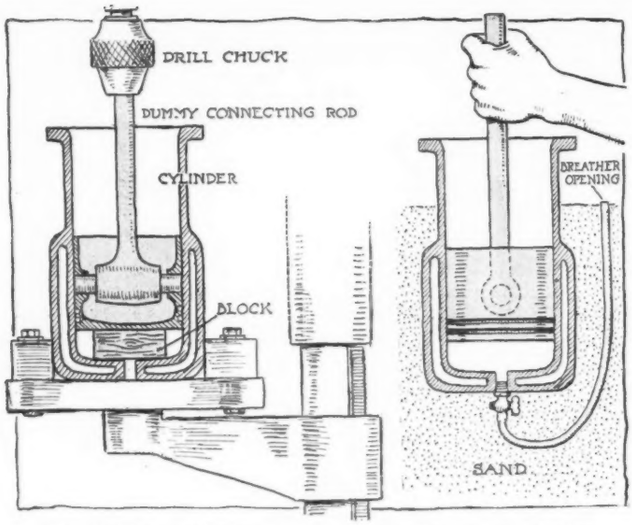


Fig. 2—Two methods of supporting cylinder for grinding

will eventually work its way up past the tappets and smear the side of the crankcase, giving it an unsightly appearance, besides wasting a large amount of oil. You may detect too great a supply of oil in the crankcase also by a tendency for the motor to smoke when the throttle is open for the purpose of acceleration on the level or when starting to climb a hill. The method to cure the trouble if there is too much oil in the crankcase is to lower the height of the standpipe projecting into it. This can be done by tapping it down gently with a hammer. Do not lower it very far as a very small change in the oil level will make a big difference in the amount which reaches the cylinders.

Short Circuit to Oldham Coupling

Editor THE AUTOMOBILE:—I have an E. M. F. 30, 1909 model, which is running finely with the exception of a large spark which is seen on the Oldham coupling between the magneto and pump. This spark is not seen when the engine is running on the batteries. It is seen only when the engine is running on the magneto.

Please give me some information in regard to this.

Houlton, Me BERT WISE.

—All this appears to be due to a short circuit. The probable cause is that there is play in the Oldham coupling. As you know, the current is grounded and therefore passes through the metal work of the entire motor. When the play exists there is very apt to be an arcing at any point of the motor where the play occurs. This will give a spark which will be visible at any time when the motor is running in the dark. If you take the play out of the Oldham coupling you will probably eliminate the spark, although the spark itself will do no harm. A method pursued with great success in taking the play out of Oldham couplings is to coat the driving faces with solder. Use a hard solder for the purpose and after roughing the surfaces to be soldered with coarse emery thoroughly soak them with flux in order that the solder will get a firm grip on the metal. Oldham couplings are very much subject to wear and generally produce a rattling sound when a slight amount of play has developed. Perhaps you have noticed this trouble as well as the spark.

Wants to Know Meaning of Direct Drive

Editor THE AUTOMOBILE:—What is meant by direct drive, and which is more advantageous, direct drive on third or fourth speed?

2.—Please explain the meaning of a gear ratio of 4:1.

3.—Has the two speed rear axle any advantages over a four speed gearbox and if so what are they?

4.—What are the gear ratios of the Chalmers Six 1913 touring car?

5.—Does the average electric self-starter weigh more or less than an air self-starter? E. H. B.

Mount Vernon, N. Y.

—As may be guessed from the use of the word direct, direct drive means that the power is directly transmitted to the driveshaft without passing through any intermediate gears. Fig. 3 gives a view into a gearbox, showing two positions of the gears. In the upper view they are given in direct and in the lower view in indirect drive. In either case the layshaft revolves as the two gears B and C are always in mesh. In this gearbox, which has three speeds forward, direct is on high. The jaw clutch transmits the drive directly to the driveshaft. When the gears are shifted to second the drive passes through an intermediate set of gears in order to give the required reduction. When a car is said to have its speed direct on third and it has four forward speeds it means that on the high speed, or fourth, the motor turns over more slowly for a given speed of the wheels. In other words, instead of the gear giving a reduction of motion it magnifies it. There are advantages on both sides. When direct is on high there is a more gradual change in the speeds between low and high; that is, there are four steps up instead of three. A driver can drop back to a lower speed without having to go to such a great reduction as he would where there are but two speeds lower than direct. His fuel consumption would probably work out to be slightly less on hills, as he would be able to use a high gear ratio in many more cases than were he compelled to drop to second speed.

A great advantage in having the fourth speed geared above direct is in traveling through level country at speeds of 20 miles an hour and upward. Here the motor turns over much slower for a corresponding speed and hence the fuel consumption is less. It is largely a matter of choice on the part of the user, but it has come to be a matter of adapting the car to the country it is to be used in on the part of some of the manufacturers.

2.—When a car is said to have a gear reduction of 4:1 it means that the motor revolves four times to one revolution of the rear wheels.

3.—The two-speed rear axle has the advantage of offering a choice of six speeds with a three-speed gearbox, as either of the rear axle drives may be used with any of the three speeds. With a four-speed gearbox and a two-speed rear axle you would have the choice of eight forward speeds.

4.—On the Chalmers Six touring car the reduction on high was made in four types, depending on the gearing at the rear axle, as the gearbox provided a direct drive on fourth speed. The reductions were 4:1, 3¾:1, 3½:1, and 2¾:1.

5.—The average electric starter means an added weight of about 50 pounds. This is approximately the same as is necessary in an air starting system.

Having Trouble with Cylinder Fit

Editor THE AUTOMOBILE:—I have an Overland, Model 59, 1912, the motor of which has been giving me considerable trouble. I am thinking of having my cylinders rebored and new pistons made for the same, and think your advice would be useful to me in this matter. I have no trouble in getting plenty of local advice as to what I should do, but I thought that you would be able to give me some assistance in this case.

I am undecided whether to put patent rings in my pistons, and have been advised both ways in this matter, but I would like to know whether you think it would be wise to place one or two of these patent rings on each of my pistons. A local dealer here advised me to put an upper and lower patent ring in and putting the ordinary type of ring between the two. I wish you would advise me as fully as possible what you think of this step. The mechanic with whom I talked regarding this matter is opposed to this patent ring proposition, and assures me that he can put my cylinders in a condition that will prevent any recurrence of my past trouble by using the ordinary type of ring now in use. He also advises the putting of a groove in the lower part of the

piston and drilling holes in the bottom of same for drainage purposes. I would like to know what you think of this idea.

I would also like to ask you what you think of putting an additional ring about one-third of the distance from the bottom of the piston; this I presume should be put in the groove above mentioned for drainage.

I recently talked with the local manager for the Krit automobile company, and he showed me how the Krit company was putting a ring in the lower part of their piston, and the proposition looked good to me. I wish you would advise me what you think of this idea, too.

I am aware that you are usually opposed to innovations when the same are radically different than the plans of the maker of any particular car, but if I am to continue to drive an Overland car I know that I must do something to overcome the troubles I have been having in the past with the motor. F. A. GRIFFITH.

Kansas City, Mo.

—If you wish to do this job yourself and you have had some mechanical experience you can lap in your piston by either one or two methods and secure a beautiful fit. If you have a drill press at your disposal it will be possible to rig up a dummy connecting-rod, apply the piston to it and put it in the chuck of the drill press, centering the cylinder on the table below it. The rings, of course, are not used on the piston during the grinding operation, but the grinding compound, consisting of ground glass thinned out well with oil, is inserted between the piston and cylinder. The drill press is geared at its lowest speed and the feed as slow as possible. The piston is then moved upward and downward slowly in the cylinder as it is being spun around by the drill arm. The grinding work has to be watched with the greatest care in order that the job is stopped at the proper moment. Too many strokes with the drill press will make the cylinder too large and the fit will be spoiled. It takes about a half hour or a short time longer under ordinary conditions to do this grinding, so that the observer should be on the *qui vive* for about 20 minutes after the work has been started. In order that the piston shall properly center itself, a small amount of play is allowed at the wristpin end of the dummy connecting-rod. If you wish to do this job by hand, you can secure results which will be just as good as the above method, but it is a long tedious operation. The cylinder is placed on its head on a level piece of ground and sand banked up around it to give it a steady foundation. The dummy connecting-rod is then made up and the grinding material spread thinly on the piston in the manner outlined above. The motion used in working the piston up and down is the same as that employed in grinding valves, with the addition of the reciprocating motion. That is, the piston is worked up and down while the wrist is turned through about a quarter circle for a definite number of times during the stroke upward and downward. After this is done for 5 or 6 minutes the piston is withdrawn and turned to another position and the same process repeated. It will take 3 or 4 hours to do this work, but the result will be a fine grinding job. It will be noted that it is necessary to have some release for the air through the sand in order that the piston may be moved freely up and down, care should be used that the tube is carried free of the sand as in Fig. 2 in order that none of it can be sucked into the cylinder.

It is not necessary to add any rings to the piston. If you wish to put a patent ring in the top groove you can do so without danger and a ring of this kind will often stop oil leaks where the supply is too copious. It is not good practice though to try and make up imperfections in the cylinder surface by the use of special rings, as the results cannot be expected to be as good as they would be in a perfectly ground cylinder. It is possible for you to use an oil groove in the piston if you feel that you are getting too much oil into the combustion space. This can be done in the manner suggested in your letter by cutting a groove in the lower part of the system with oil holes for drainage.

Wants Compression of Different Cars

Editor THE AUTOMOBILE:—Will you kindly give me the compression in pounds per square inch of the following cars: Packard 38 and 48; Pierce 38 and 48; Cole 40, 1913; Hudson Six; Stutz Six, 1914?

2.—I would also like to know the valve diameters of the above cars. E. H. K.

St. Louis, Mo.

—The compression in pounds per square inch of the above cars is as follows:

Packard 38	55 pounds	Packard 48	55 pounds
Pierce 38	60 pounds	Pierce 48	65 to 70 pounds
Cole 40	50 pounds	Hudson Six	60 pounds
Stutz Six	80 pounds		

2.—The valve diameters of the above cars are as follows: Packard 1.5 inches, Pierce 1.87 inches, Cole 1.87 inches, Hudson 2.25 inches, Stutz 2.25 inches. In all cases the exhaust and intake valves are interchangeable.

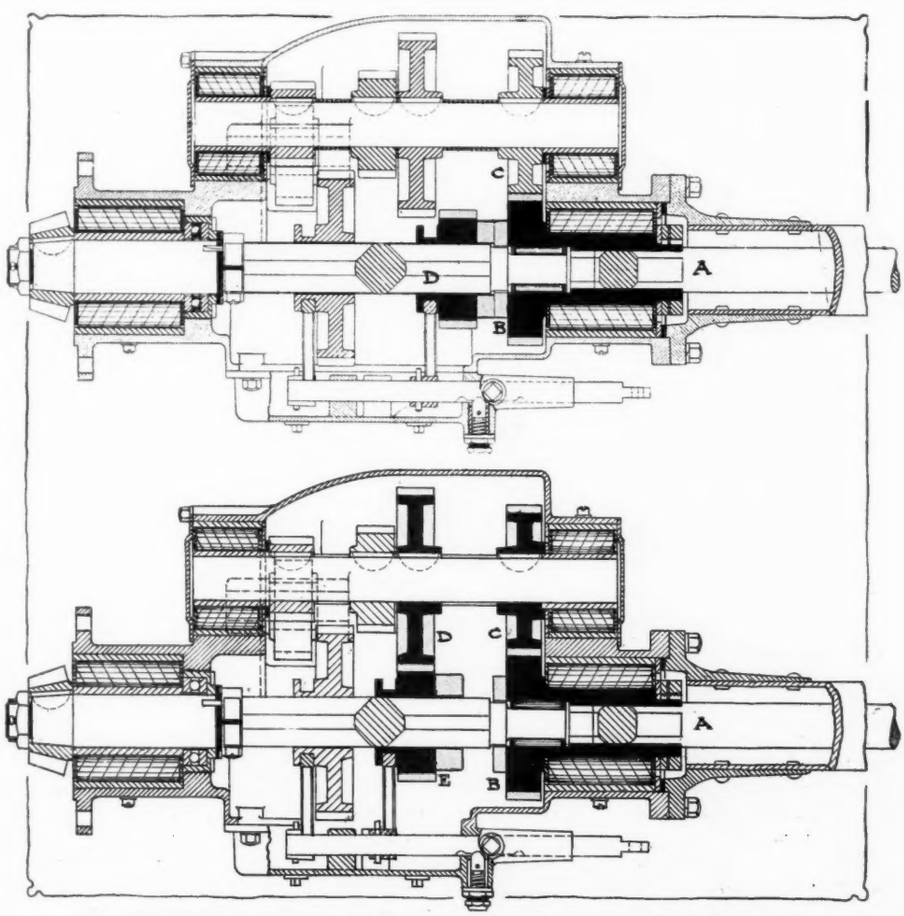


Fig. 3—Views of gearbox showing direct drive above and indirect drive below

The Engineering Digest

Construction Details from Tested Trucks—Using Vehicle Springs as Struts with Chain-Drive—Atomizing in the Jet—Resolution to Oust H. P. and use Kw.

AFTER the close of the annual military trials of motor trucks in France many comments upon mechanical details of vehicles which went through the tests have been published, and in most cases the mention refers to special construction with which no trouble was experienced, although this does not always mean that the suitability of the feature in question was completely proved. A number of paragraphs culled from these comments are presented in the following.

The driving-push in 2 worm-drive Peugeot trucks is transmitted through the vehicle springs. An advantage obtained from this design—as it is ingeniously materialized in this case—is that the worm, worm-wheel and differential can be dismounted, together with the transverse shafts, without touching the vehicle wheels or jacking up the axle.

Clement-Bayard trucks have an elastic joint in front of the gearbox. It takes the form of a jaw-clutch with rubber-cushioned jaws and serves to take the brunt of shocks from the clutch in front as well as from the gears behind it. Another elastic joint connects the gearbox-shaft with the drive-shaft to the differential. This is in form of a drum containing a series of coil springs.

The chain-sprocket pinions on Aries trucks are keyed to their shaft by means of a special tenon which is so shaped and dimensioned that it shears off in case of a violent shock transmitted through the chain. This saves other breakage. One of the models—the lightest—has double springs, one above the other, of the socalled two-story type.

On Blum-Latil front-drive and four-wheel-drive trucks, in case the oil pump in the crankchamber ceases to operate, a spring is released which grounds the magneto and thereby stops the motor. These vehicles, like several of the others, are equipped with a winch for hauling a loaded trailer in difficult places, or even for pulling the truck itself out of a hole. The work demanded is sometimes very severe. To make sure of being able to perform it, the Blum-Latil people hook a tackle with two or three sheaves to the trailer and make the winch roll up the free end of the rope. They also provide brakes for all four wheels, on the plan shown in Fig. 1, all the brakes being operated at once and by one lever. The latter turns a transverse shaft F with a tee at each end, and from each tee cables run to brake shafts for the front and rear wheels on the same side of the vehicle. The brake shafts are provided with universals, so as to allow for the turning of the wheels, as all of them are used for steering.

Aluminum-bronze is used for the pistons in the motors of Rochet-Schneider trucks, having been tested for several years in pleasure cars of the same make. They are ribbed internally.

The only new feature relating to chain-drive was observed in Delahaye trucks. The driving-push in these vehicles is transmitted through the springs, as in the Peugeot trucks, with shaft and worm drive, but, as it is necessary to provide for adjustment of the chains, the spring is pivoted at its front end to a special compression shackle, and this shackle is immobilized by a short chain-adjustment-device reaching from the middle of the shackle to a collar upon the shaft of the chain-pinion. This method relieves the truck of a heavy radius rod, besides clearing the space for a chain-casing. It is shown in Fig. 2. [The practice of employing the springs for transmitting the driving-push from the wheels to the vehicle frame is borrowed from omnibuses and other vehicles with shaft or worm drive where it has been proved acceptable. Its application to chain-drive, as well, would seem to necessitate considerable slack in the chains or else the use of springs so stiff that scarcely any lengthening of the distance between the wheel axle and the sprocket pinion will take place when the springs are compressed by load or shock or both.—Ed.]

Oscillating front wheels, on the Genillon system, were used on La Buire trucks and did not give occasion for troubles. They swing around an eccentric shaft in their enlarged hub when a shock is received which acts approximately in the plane of the wheel and not vertically, and the shock is thereby mitigated.

The Balachowsky & Caire gasoline trucks with electric transmission, the mechanism of which was recently described in these columns, did not obtain the expected chance to demonstrate the soundness of their main principle, as the motors in the wheels, which are not essentially different from other electric wheel motors, went wrong in the beginning of the series of tests.

Some Statistics

Among the motors in the trucks 14 models were designed for a standard speed of 1,000 revolutions, 5 for 1,100 and 6 for 1,200. The bore of cylinders varied from 75 to 120 millimeters and the stroke from 130 to 160. The average dimensions were 100 bore by 140 stroke. Among the radiators 17 were of the type with flanged tubes, 9 of the cellular or honeycomb model and 8 of the Solex centrifugal-blower type. Pressed steel was used for 22 frames, rolled steel shapes for 14 and armored wood for 1. Chain-drive still predominated, being used for 25 truck models, as against shaft-drive for 11. While 9 models had wood wheels, 9 had wheels of cast steel and 1 of pressed steel.—From *Poids Lourd, Génie Civil* and *Omnia*.

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TAKING the suggestion from an automobile made in Detroit which runs on one front and one rear wheel, like a motorcycle but with a well-built-up carriage body, a German contemporary finds occasion to wonder what has become of the gyroscope and the one-track railway. With the equipment needed for operating motor-starters, it should be practicable to keep a gyroscope going at high and constant speed, in a vacuum, with an expenditure of power which would be negligible in comparison with the saving effected by dispensing with two wheels, a differential gear and long and heavy axles.

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Fuel Saved by Smashing the Fluid Within the Jet Before It Reaches the Outside Air Current

UNSCREW the jet in whatever carbureter you are using and substitute the Mills Economizer. The result will be a saving of gasoline up to 25 per cent, according to *La Vie Automobile* of August 9. The economizer is in itself a jet of rather large bore into the upper end of which there is threaded and adjusted a little hollow cone with lateral perforations. It is introduced from the lower end of the jet by means of a thin screwdriver. The gasoline is then drawn through the perfora-

tions and is pulverized by passing over their sharp edges and against the inside wall and top-edge of the jet, thus presenting the fuel already atomized when the induction-current strikes it in the narrow portion of the venturi tube. The height of the atomizer-cone in the jet is adjusted by trial in each case. Fig. 3 shows the top of the jet with the cone underneath, where it is inserted, and the assembled device. Very similar provisions for causing the gasoline to become mixed with a little air before issuing from the jet have been described from time to time in these columns in connection with various carbureters and it may perhaps be assumed that the Mills device would have little effect to improve the fuel economy excepting in those cases where the jet ordinarily supplied with a carbureter affords merely a smooth channel for the fluid.—Ed.]

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OUT of 2,194 taxicabs in Berlin 277 are electric. Of these 178 belong to one company. Among the drivers of taxicabs at least 120 own 2 vehicles each, and 67 own 3 each. The largest company operates 84; two other companies 66 and 52 respectively. From recently published statistics it appears [unless the French translator has made a mistake] that the German automobile manufacturers make a practice of owning taxicabs. The Adler company is credited with the ownership of 577, Opel with 396, NAG with 198, Benz with 153 and Durkopp with 135.—From *Poids Lourd*, August 29.

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The Cutting of Metal by High-Speed Rotation of Thin Toothless Steel Disks Now Economical

LATELY the use of rapidly revolving smooth-edged steel disks for severing bars of metal—even very hard steel—has entered into strong competition with the oxy-acetylene flame and with the cold-saw made of high speed steel or equipped with inserted teeth of this material. The method depends in principle on the fact that rather ordinary steel can be used for the disks if it is revolved with sufficient rapidity, as in that case the metal to be severed becomes redhot and eventually melts from the heat developed from the friction with the blade and when molten is hurled away from the path of the latter, while the blade, on the other hand, keeps cool by its rapid rotation in the air. So long as the technique of the method had not yet been developed, however, it was not always easy to keep the blade cool. When the cut was deep or the blade too thick or its circumference too small the blade would soften and stick in the cut. Cooling by water was tried ineffectually. Either it cooled the work as well as the tool or it drenched the surroundings, being scattered by centrifugality. It was finally found that disks from 20 to 36 inches in diameter create a current of air which follows the disk into the slit it has made in a large work-piece if the speed is about 3,000 revolutions per minute and assists in burning and driving out the displaced metal, and also that the best material for the disks is a cold-rolled steel of the kind classified as mild and tough. The most suitable driving power is an electric motor, which can be of small size, as the required power is small, and the electric motor has the advantage that its shaft can readily be placed vertically or at any desired angle, which is sometimes convenient for the handling of the work. The disks will make oblique cuts as well as those at right angles. The economical advantage over sawing is derived partly from the higher speed of the work and partly from the smaller wear and less costly nature of the tool. In comparison with cutting by gas flame, circumstances must decide.—From *Electrochemische Zeitschrift* for August.

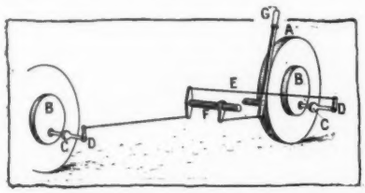

Fig. 1—Brake system for four wheels

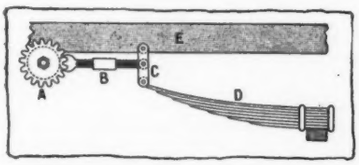

Fig. 2—Combined radius rod and spring

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French Kerosene Motor and German Motor Plough

Field of Self-Propelled Machinery and Motor Tools for Farmers Shown to Be Wide Open for Hardheaded Designers

HOW to dispense with hands and horses in the cultivation of the soil and, at the same time, how to increase the revenues from the cultivation so as to be able to pay attractive wages to the workmen who after all cannot be dispensed with! These have been the questions principally engaging the attention at the international congress of motor-culture just concluded at Soissons, France. It is agreed that motor power in suitable form for the agricultural work represents the first and foremost requirement and, secondly, that the methods of cultivation, on the other hand, must be adapted to the motor power, not only to its advantages but also to its limitations, the latter being largely identified with the large charge for investment. The concurrent adaptations from both sides present difficulties of the highest order, because both the makers of the machinery and the tillers of the soil are called upon to set aside accustomed ideas and acquire new knowledge of a complicated nature which can ordinarily be grasped only by prolonged practical experience. The result has necessarily been that experience in both directions has been placed at a discount in comparison with vigorous new thought and enterprise in testing out new methods in practice.

At Soissons, the instrumentalities among the exhibits which were considered most interesting, because apparently in best accordance with the complicated requirements referred to, were the Bellem & Brégéras motor, of which an illustrated description was given in The Automobile of March 20, and the Stock motor plough, which was described in part in these columns in 1911 on account of its promising general design. The Caterpillar tractor of American origin and development was also favorably noticed, mostly by reason of its ability to work on very steep grades and in very soft soil.

The Bellem motor is remarkable because it meets the fuel problem in the manner which appeals to the agriculturist. Gasoline is almost out of the question, not only because its price is rising steadily but also because its use by unskilled laborers and especially its storage in the country involve dangers and difficulties. Benzol has become dearer ever since its value as a substitute for gasoline became recognized. Alcohol, which could be made the ideal fuel, with some enriching admixture or even without it, if only the governments of the world did not tax and legislate it out of the competition, cannot be contemplated until its production is made free of restrictions and unlimited. Acetylene gas, which could also be produced in unlimited quantities, is not yet available at a low price in the only form—dissolved in acetone or a substitute for acetone—in which the dangers resulting from its explosiveness in almost any mixture with air are obviated. There remain as fuels for agricultu-

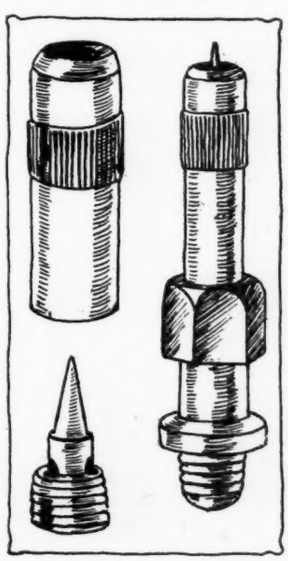

Fig. 3—An atomizing jet

ral implements only kerosene and the heavy oils. So far no kerosene motor has been produced, unless of the heavy Diesel type, which can be started from cold without the use of gasoline or another volatile fluid. The motors which are started by first heating a hot-chamber bulb projecting from the combustion chamber by means of a Bunsen burner have come nearest to the needs but cannot be started without loss of time, while for agricultural work short stops and frequent re-startings are unavoidable features. The Bellem motor is much more similar to automobile motors and is in fact intended to be used for automobiles as well as for motor implements and agricultural tractors. It can be operated at the same speed as an automobile motor and weighs little more; it has also the same system of ignition—by magneto. Those who have seen it in operation at Soissons or at some of the laboratory tests to which it has been subjected look upon it as a threatening competitor for any automobile motor now in general use. It has no carbureter; the kerosene is injected by pump-pressure through a passage with labyrinthine apertures and baffle walls causing the fuel to become finely pulverized, but this alone would not be sufficient to prepare it for ignition. It is not injected into a cylinder full of air, which would hinder the formation of a fine mist of vapor. A vacuum is created in the cylinder while the injection takes place by holding the induction valve closed during the first portion of the suction stroke, and then, when the mist has been formed and the piston has reached to about 30 degrees from low center, fresh air is admitted with a rush which is immediately followed by the compression and by ignition. Two or three turns of the crank, it is reported in *l'Auto* of August 30, suffice always for starting the motor and, after it has become hot, heavy oil will keep it running. The important features are the pulverizer-valves and the injector pump. There is one of each of these for each cylinder. [It seems that some changes have been made in the details of the pumps since the first description appeared in this paper, and an illustrated description of the pumps and the fuel control, as these features are now represented in *l'Auto*, is being prepared for next week.—Ed.]

Slow Motors Still Preferred

At one of the sessions of the congress the requirements to be made of agricultural motors were discussed. No definite opinion was voiced with regard to stationary motors, but with regard to those intended for motor ploughs and tractors the opinion predominated that these should be relatively slow and consequently heavy, with about 400 revolutions per minute the maximum speed. With regard to the motors for light work it was reluctantly admitted that a speed of 800 to 1,000 revolutions would be necessary, as the motors otherwise would be too heavy for convenient transportation and replacement from one machine or tool to another. These official opinions were mostly based on the supposed frailty of light motors with high speed and on supposed difficulties in having them operated with sufficient skill by rural workmen. Another objection was based on the amount of gearing required for reducing the speed from the motor to the tool. On this subject a clash of opinion existed between the expert agriculturists and the expert motor builders, the latter considering the predominating view as one which has become superannuated by recent progress and maintaining that in fact the modern high-speed and light motor can be operated by unskilled hands much better than the cheaper and slower motors because it must necessarily be very carefully constructed and is always provided with an automatic oiling system leaving nothing for the operator to do than to see that the oil reservoir in the crankchamber is filled, thus giving no occasion for meddling or tinkering.

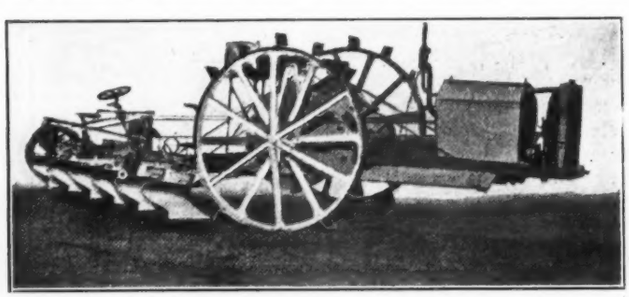

Fig. 4—Favorite motor plough at recent agricultural meets

Design of Stock Plough

It is admitted in the French press that the Stock motor plough, made by a German company which has recently found occasion to enlarge its capital stock from 1 to 5 million mark, made a better impression than any of the ingenious French machines. Colonists in Algeria and Tunisia purchased this make in several instances, but a motor plough quite suitable for farmers of moderate means is still wanting in the market; one whose machinery and power, while not too expensive, can be turned to account all the year round in some manner, so as to return interest on the first cost. The Stock plough is high-priced but is already in extensive use on large German estates and has been adapted to act as a tractor for other agricultural machinery—mowing machines, harvesters, cultivators, sowers and planters, potato pickers and weeding machines—and also as a stationary engine by means of a pulley attachment. Its general design is shown in Fig. 4. It differs radically from the majority of machines built for similar purposes. It is balanced to the fore and aft of a single axle and two large wheels. The slight excess of weight to the rear of the axle is easily supported on a single light steering wheel at the extreme rear and left which is controlled from the driver's seat and has a sharp circumferential cutting-edge which enters the soil and helps to keep the furrows straight. It can also be raised or lowered by means of a small winch under driver's control. The large driving wheels are fitted with blades of variable size to ensure traction under all circumstances, and for travel on the roads these blades may be removed and rubber blocks, forming a continuous tire surface may be substituted. The most important economical feature of the design is that only one man is required for the operation. The six plough shares are demountable, so that shapes can be fitted suitable for the work in hand. The motor develops a power of 42 horsepower at 720 revolutions and can be sped up to 50 horsepowers. The cooling is by the thermo-syphon system.

According to *Technique Moderne* of August 1 one of the performances of this motor plough which particularly impressed visitors at the competition held at Alger consisted in crossing a ditch 3 feet wide and 2½ feet broad, which it did repeatedly with great ease—as might have been expected from its two-wheel construction.

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AT its annual meeting in June the Society of German Electro-Technicians passed a resolution declaring that all engineering bodies favored the adoption of the kilowatt to take the place of horsepower as a unit for the measuring of power or work and setting January 1, 1914, as the day after which its members should no longer use the term horsepower at all. It was also decided to urge the Society of German Engineers to pass a similar resolution, but at a meeting of the Scientific Counsel of this society it was held that the unanimity claimed by the electrical sister society was not yet realized among the engineers in general and that the date set for the electricians was premature for the fraternity at large.—From *Z. V. D. I.*, Aug. 16.

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ACCORDING to *La Nature* portable houses are now made which can be stowed away in an automobile and can be set up in two hours at any convenient camping place. They are composed of interchangeable panels made of a compound of cement and asbestos and cost from $190 to $250, according to size. It will thus be on the order of the day if American manufacturers build automobile bungalows for taking seekers for rest or pleasure from a camp at the seashore to one in the mountains as the season changes. The imagination sees a fertile field for an up-to-date company to exploit the popular tendencies.

Road-Building Methods Must Be Improved

If More Durable Construction Is Not Adopted Immediately, Upkeep Cost Will Soon Prove Insupportable

"RADICAL and immediate changes in road building methods must be made if the country is to keep pace with the industrial, commercial and social needs of the people. Unless more durable roads are built than the water-bound and bituminous macadam that are now the common standards of the best types of State highways, the burden of the cost of maintenance will become insupportable in a few years."—AUTOMOBILE CHAMBER OF COMMERCE.

This quotation represents the sentiment of the Automobile Chamber of Commerce on the good roads movement in America as voiced at its meeting last week when it passed a resolution namely: "That we realize thoroughly the necessity of improved road conditions . . . and we believe it is advisable to adopt the construction that after thorough investigation will give the greatest permanency, first cost being of lesser importance."

The executive committee of the Automobile Chamber of Commerce has gone further and at its meeting in Detroit drew up its eleven principles of road construction which are

1—Highway construction is a scientific and engineering problem.
2—Proper location, grading and drainage are first essentials of any good road.
3—Highways should be of a character directly suited to the kinds and volume of traffic using them. It is uneconomical and a waste of time and money to build roads unsuited to the volume and character of traffic and of short durability.
4—Road foundations, culverts, retaining walls and road base should have a durability equal to or exceeding the life of bonds issued to pay for the construction of the roads.
5—When appropriations are made for road improvement, suitable and sufficient provision should be made for maintenance of the improved roads during the life of the bonds issued to pay for them.
6—Volume of traffic and kinds, speed and weights, with loads, of vehicles using the roads should be ascertained before beginning the construction of a state road, by taking a traffic census, and the rate of increase and change of character should be calculated well into the future.
7—Construction or reconstruction of all main through roads between important trade centers, state capitals and centers of a large population (50,000 and over), not more than 100 miles apart should be of permanent character.
8—Roads which sustain a considerable volume of mixed horse and motor vehicle traffic should have a surface that will not ravel under such traffic; that will not become dusty by wear and the effects of weather; that will be impervious to water, and will not be loosened by frost.
9—Until such time as traffic over subsidiary roads and relatively little used country roads warrants improvement with permanent construction they should be maintained in serviceable condition for the traffic using them by relatively inexpensive methods, such as dragging, or by the application of gravel, sand, clay, shells, etc.
10—Bridges and culverts should be of sufficient strength to carry the traffic that can be sustained safely by the roads of which they form a part. Pending the rebuilding or strengthening of bridges to such standard, signs announcing their safe capacity should be displayed prominently upon them.
11—Traffic development is an economic necessity and the capacity of roads and bridges should be adequate to the industrial and commercial needs of the communities they serve.

"Permanent Highways" is the new good roads slogan of this national governing body. It is not enough to talk good roads but the day has come to talk permanent roads. A large part of the principal road system of the country is in poor condition or is maintained in good condition only at excessively heavy cost for repairs. Even new macadam roads, built at a cost of $7,000 *to* $10,000 *a mile or more, have become so badly worn in a year that expensive repairs were required.*

Blame Motor Vehicles for Road Wear

Because this increased rate of destruction was coincident with the increased use of motor vehicles, the road authorities lay the blame upon the swift automobile and the heavy motor truck. Arguing that these do the damage and therefore should pay for it and be prevented, in so far as possible, from doing greater damage, they have sought, with considerable success, to impose special taxes upon motor vehicles to create a road repair fund and to limit the weight and speed of motor trucks.

All the bills that have been introduced in the various legislatures during the past winter and this spring to increase registration fees of all motor vehicles and to limit the weight of motor trucks are based on the ground that these vehicles are ruining the roads and ought to be made to pay for the damage done.

If motor vehicles do serious damage to the roads when they are operated under conditions for which they are designed and built and at *speeds and under loads at which they are most economical, then it is evident that the roads are not suited to their use. To avoid such damage it is necessary to build roads to meet traffic conditions—not only as they exist today, but as they will obtain during the next 25 years.*

Anyone of ordinary intelligence can foresee that decades before we have finished paying for the roads that are being built under 50-year bond issues, the predominating traffic on all main roads as well as on city streets will be by motor vehicle. So it is perfectly clear that without further waste of time the State highway departments should *specify a type of road construction and paving materials that will permit the operation of automobiles and heavy motor trucks without injury to the surface or foundation.*

Under present conditions we have the anomalous situation that we—meaning manufacturers, dealers and users—are taxed on real and personal property for the construction of a kind of highway we do not want *because it is not suited for motor traffic and then, when we run our cars and trucks over the road, the authorities demand that we pay for repairing damages that they say these vehicles do to it.*

City Men Have To Pay for Country Roads

City property owners probably will pay about 85 per cent. of the $100,000,000 authorized by New York State for road construction, yet all of this money must be spent on building roads outside of incorporated cities. Motor truck users are as a rule large property owners and they pay heavily toward this road fund, for about 90 per cent. of motor truck traffic is confined to cities and their suburbs. It is obviously unjust to tax the owners of these city-used vehicles for road damages done by horsed-vehicles, passenger cars and the 10 per cent. motor traffic that use the roads.

The interest that dealers in the motor car world are taking in permanent roads is well indicated by the expressions from them on the subject as they see it today.

"If New York State keeps spending much more money in impermanent highways, it is liable to discredit the whole good roads movement in other states, because of the dissatisfaction at the New York roads, which have cost so much money to not only build, but maintain."—R. D. Chapin.

"There should be only two kinds of roads—concrete and gravel. Concrete is the last word in efficient and durable surface at not too great a cost, and gravel the best farmer's road at the minimum expense. It is a waste of time to build roads of anything better than gravel and not so good as concrete."—S. D. Waldon.

"Roads should be constructed with good foundations, because anything placed on a good foundation can be maintained, while otherwise the whole structure may go to pieces and require complete reconstruction."—L. H. Kittredge.

The users of motor vehicles are taking as important a part in this road improvement as vehicle manufacturers and not infrequently they are as acute students of road construction and maintenance. In order to get the opinions of users on this subject a series of questions was propounded and the replies segregated. From these replies the causes of road construction in order of importance are:

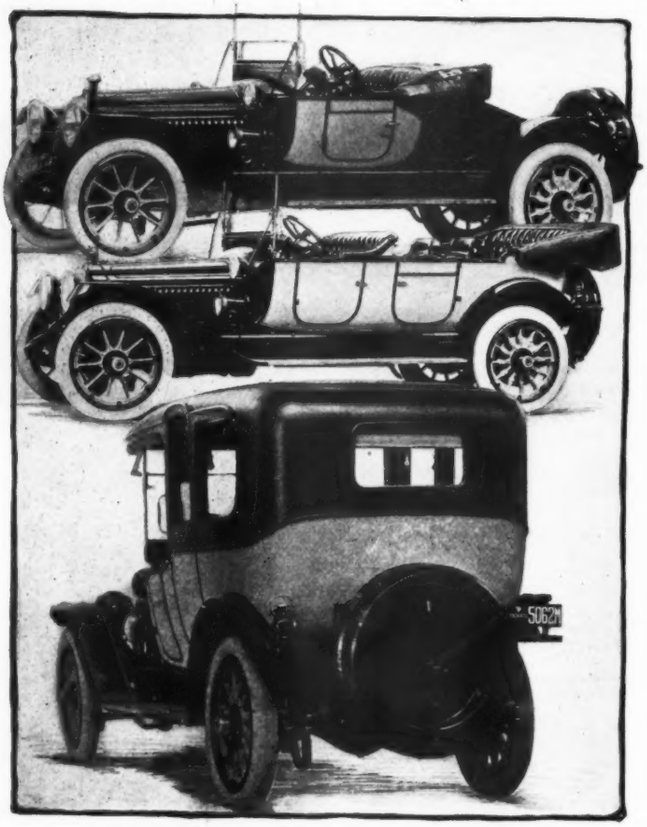
Improper construction and poor materials.
High speed of pneumatic-tired vehicles.
Lack of prompt repair when breaks appear in the road surface.
Narrow iron tires on heavily loaded wagons.
Horses' hoofs with calked shoes.

Savannah Races in Doubt

SAVANNAH, GA., Sept. 8—Unless there is a satisfactory number of entries on hand by October 1 the Grand Prize and Vanderbilt Cup races will not be run this fall. The manufacturers are insisting on having entry fees cancelled and the Savannah club declares that it will not do this even if the races have to be declared off. The Peugeot company has agreed to send two cars if Savannah will pay the transportation charges and waive entry fees. This will be impossible.

1914 Packard 38

Greatest Change Made in the Motor—Nineteen Body Styles —Oil Forced to 35 Bearings



In the new Packard 38 the 19 body styles listed are so standardized that they all can be fitted on the standard chassis with 140-inch wheelbase. At the top is the runabout, in the center the 7-passenger touring car, and at the bottom the limousine with curved back and rounded roof, a standard design on all 7-passenger enclosed body styles. The new style of cowl is shown, and also the new bonnet lines, which are enlarged as they approach and form a transition into the cowl

New Features Appearing in the 1914 Packard Six, Model 38

MOTOR

Oiling system changed—all piping within crankcase—camshaft drilled to carry oil.
Siamese exhaust manifold—separate passage for each three cylinders.
New design of inlet manifold—hot water jacketed.
Mudproof motor.
Cylinders cast in threes.
All ignition wiring inclosed within a compartment in unit with the water outlet manifold—no wiring exposed.
Radiator braced from top of water outlet manifold.
Bosch duplex ignition system.
Bijur electric lighting and cranking system—motor and generator separate.

CHASSIS

Worm-bevel axle driving gears.
Wheelbase increased to 140 inches on all models.
Rear springs slung under axle.
Brake drums increased to 17 inches in diameter.
New gearshift—8 inches further forward to allow left side entrance to car—throw of levers reduced.
New clutch brake—plate instead of band.
Rear axle housing of pressed steel and webbed—reduces size—shape altered.
Brake cross shafts mounted on axle housing instead of forward on the frame.
Brake rods within chassis instead of running along the frame outside.
Gasoline pressure pump on steering column instead of on seat.

BODIES

Front door on drive side.
Tapering hood and cowl to conform.
Price reductions—chassis offered separately if desired.
Touring car of Sedan type offered.
Tires carried at rear on all models.
One-man top—all open models.
Attachment for allowing side curtains to open with doors.
Shutter along bottom edge of windshield to ventilate front compartment.
Window regulators in closed bodies.

THIS week the veil is lifted from the 1914 edition of the Packard smaller six, known as model 38. It appears with many changes over its predecessor which was offered to the public for the first time a year ago. Many of the changes are really refinements, although some of them affect the actual construction of the various units. However, the general features of Packard design are still adhered to tenaciously, among which may be mentioned the two-unit chassis arrangement whereby motor and clutch form the forward, and gearset and rear axle comprise the rear unit.

Nineteen body styles are offered on the new 38 chassis, which is now standardized, so to speak, so that all bodies are fitted on the wheelbase of 140 inches. This is increased somewhat over that of last season's touring car and phaeton wheelbase lengths, which were 134 and 138 inches, respectively. For the roadster, too, this was formerly shortened to 115½ inches.

It is in the motor that the greatest changes are found. While the dimensions of 4 inches bore and 5½ inches stroke are retained, leaving the horsepower rating S. A. E. at 38, the cylinders are now cast in blocks of three instead of in pairs. With its cylinder dimensions, the motor's stroke-bore ratio is 1.375, and at a crankshaft speed of 1,800 revolutions per minute, it develops approximately 60 horsepower on the block.

The valves are all on the right side as formerly, the exhaust header connecting on this side also. The inlet manifold is carried on the left and due to this position opposite to the valve

Interior of Packard 38 7-passenger limousine, showing folding seat and also window regulator, by means of which the window is raised and lowered with a small crank

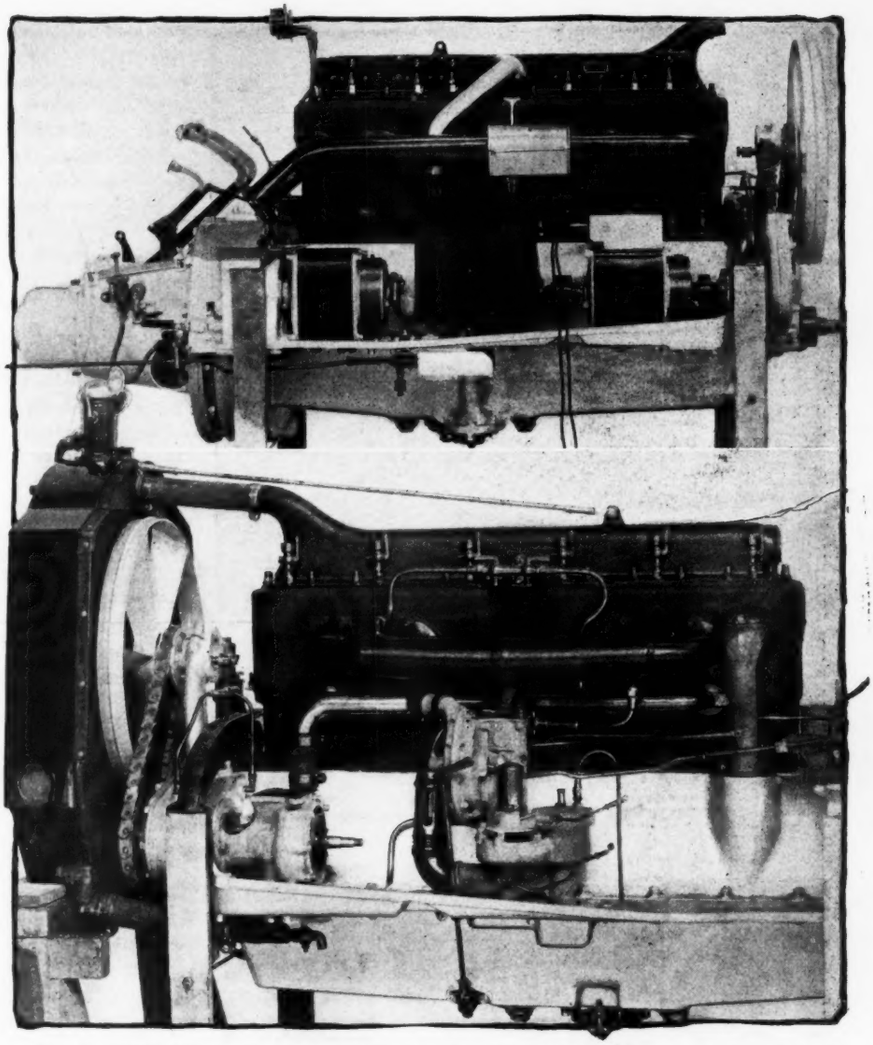
pockets, obviously some method of conducting the gas across to the valve is necessary. This year's model carried its manifold on the left side, and the manifold was split into three sections, each passing between two of the pairs of cylinders to the right side. However, the 1914 motor carries its gas across through the waterjacket space instead of having external passages. Thus the manifold connections, which are four in number, simply bolt to the left side of the cylinder castings, and from these connecting points it is distributed to the intake ports.

The inlet manifold is of new design, having a straight, horizontal main section from which the cylinder connections pass, and a short section at right angles connecting with the carbureter. It is waterjacketed in very neat fashion along its horizontal length—a good feature in manifold design. This waterjacketing should greatly facilitate vaporization in cold weather. Further warming of the incoming fuel is also accomplished by the passing of the gas through the waterjacket spaces in the cylinders.

The exhaust manifold is new in design. It is really a double exhaust type, known as the Siamese arrangement, in that each block of three cylinders has a separate passage. Although that for the rear block is cast integrally with the front header, there is now connection between the two as far back as the flange where the exhaust pipe joins.

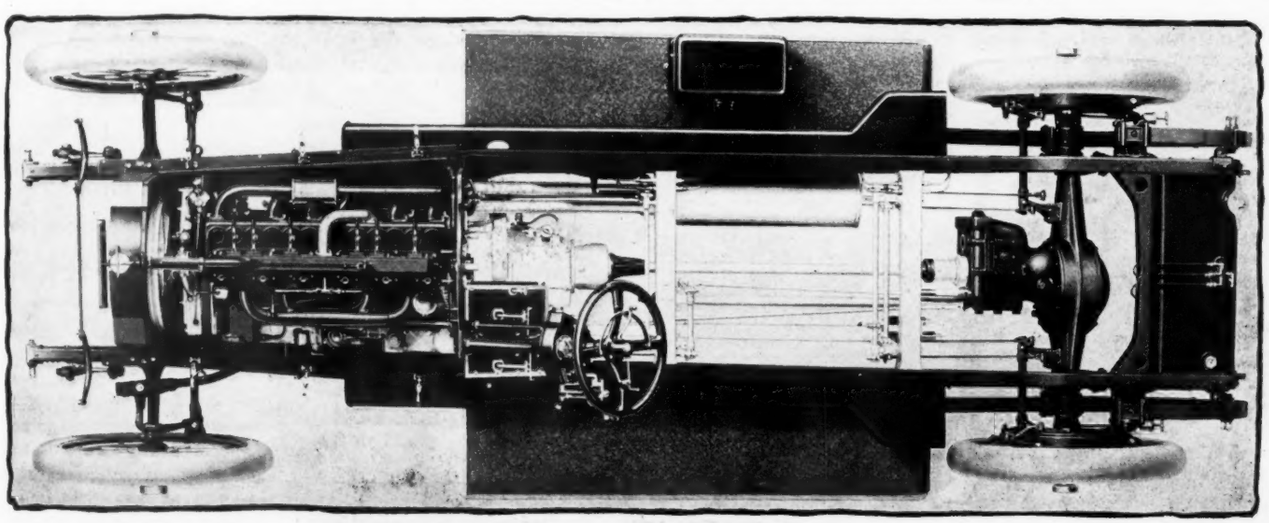
With the elimination of practically all external oil piping, an exceedingly clever oiling arrangement has been devised. The lubrication is by force feed from a gear-driven pump located in the crankcase, the system being similar in design to that used in this year's models.

After being strained, the oil is forced by the pump through an external pipe—the only outside tube in the main system—up to another strainer mounted at the forward end of the motor. It then flows

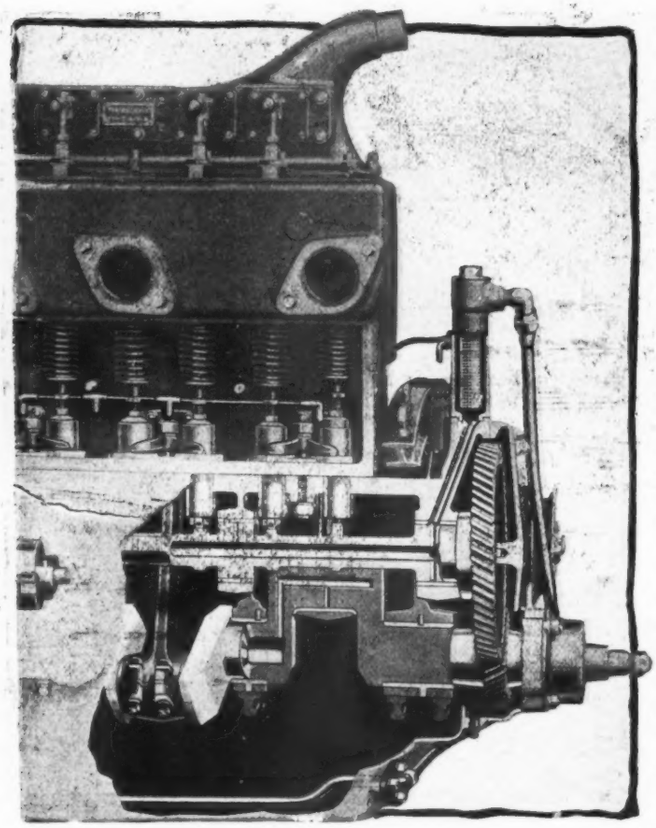


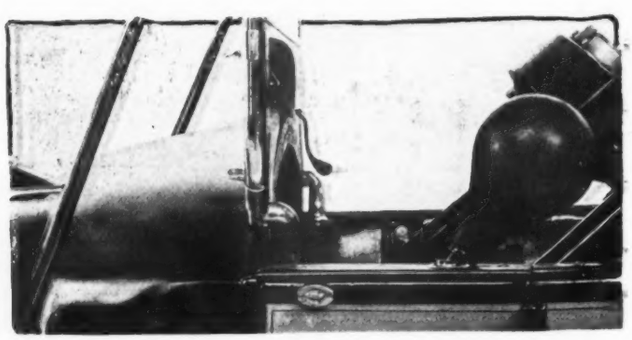
Upper—Right side of the Packard 38, showing the cylinders cast in blocks of three and also new forms of exhaust manifold. The conduit for carrying the ignition wires is formed integrally with the return water pipe. The three electrical units are Bosch Duplex magneto in center, Bijur cranking motor at rear, and Bijur generator in front

Lower—Left side of Packard 38, showing new waterjacketed intake manifold, also position of carbureter and water pump. Note the diagonal rod bracing the top of the radiator and extending rearward to a lug on the return water pipe



Packard 38 chassis, showing general design of pressed steel housing on rear axle, which is an innovation with the Packard company. Also note that three-quarter elliptic springs are underslung





Upper—Drilled crankshaft of the Packard 38 and also hollow camshaft which acts as a distributing oil manifold; also auxiliary leads to the cylinder walls

Lower—Shape of new cowl with ventilating shutter in lower edge of windshield; also bulb horn mounting on side of body

down to the camshaft through an internal passage within that part of the forward end of the crankcase which forms the rear of the timing gear housing. Holes drilled in the bearings communicate with the hollow center of the camshaft, and as the latter revolves these register with the main lead just mentioned, making a passage to the inside of the camshaft. The same registering scheme allows the oil to escape to the other bearings. Leads in the crankcase web carry the oil down to the crankshaft bearings, and thence through leads it is led down to the connecting-rod bearings. The connecting rods are also drilled and from here the oil is led to the piston pin bearings through the rods.

In the Packard 38 motor, there are thiry-five bearings lubricated directly by this force-feed system.

The crankshaft of the new motor is carried on seven main bearings as heretofore, which makes for great rigidity and absence of vibration. There is a short bearing between each two cylinders, the end bearings being of much greater length. The pistons are each provided with four eccentric rings, and straight spiral springs operate the valves. The adjustable tappets are held down by dogs for easy removal.

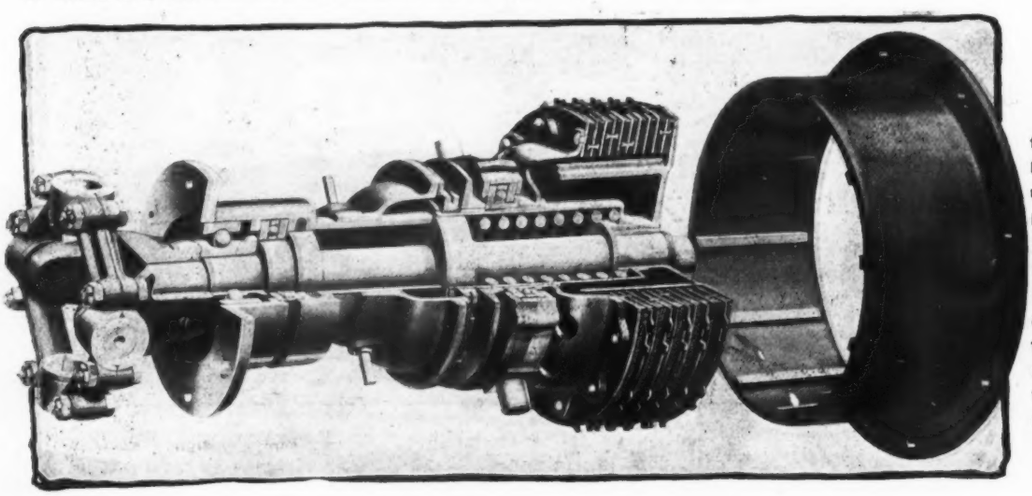
The crankcase is made in two parts, the upper half carrying the various bearings of the crankshaft. A new feature is the casting of webs on either side of the upper half of the crankcase, which, when the motor is mounted in position, extend to the frame rails and exclude all mud or water which might splash up.

Uses Bijur Starting System

The electric system of the motor is entirely new, and of a different make than that used this year. Whereas a combination motor and generator took care of lighting, cranking and ignition heretofore, the motor now appears with three separate units for the performing of these functions.

Ignition, which is entirely independent of lighting and cranking, is provided by a Bosch duplex system using a single set of spark plugs. The high-tension Bosch duplex magneto sends the secondary current directly to the spark plugs. There is no wiring exposed, a new and distinctive feature being the inclosing of all wiring within a conduit which is integral with the water outlet manifold at the top of the cylinders as illustrated on the opposite page.

While the former motor-generator was carried on the left side, the separate electric motor and generator which are a part of the Bijur combination lighting and cranking system now used, are mounted on the right of the new engine. The cranking motor temporarily gears to the flywheel to turn the crankshaft for starting and is placed at the right rear. The generator is at the front and its shaft is driven by the timing gears. Back of the generator and on the same shaft is the magneto, so that that latter occupies a central position between motor and generator.



The Clutch

The dry-disk clutch used for several years by the Packard company is continued. It consists of alternate sets of fabric-faced disks carried within a drum secured to the flywheel. An improvement consists in a new form of clutch brake to facilitate gearshifting. The method of attaching the alternate sets of disks to their respective carriers is shown

The Bijur system combines a storage battery with the main electrical units for the purpose of storing surplus energy generated, to be later given out when the demand is greater than the generator supply, for lighting the lights at night when the engine is not running, and for supplying the electric cranking motor. To start the engine, the operator pushes down on a heel button. First pressure on this starts the electric motor slowly to facilitate the meshing of the gears between it and the flywheel which the same pressure also takes care of, and further downward pressure sends additional current to drive the motor at a sufficient speed to crank the engine on the magneto.

The multiple-disk clutch is housed in unit with the crankcase, its cover bolting to the latter. A new feature of this clutch system is the substitution of a plate clutch-brake for the contracting-band type formerly used. The new one embodies a circular plate lined with a friction material, which plate, through its interconnection with the clutch pedal, moves horizontally against a collar on the gearset shaft to stop the spinning of the latter when the clutch is released so as to facilitate gear changes.

No change has been made in the gearset or its manner of operation, although a very notable difference in the rear system is the adoption of a pressed steel rear axle housing to replace the aluminum type used on all Packards up to this time. The gearset housing, however, is still made of aluminum. The weight of the axle with the new steel construction remains practically the same as this year, but the size is reduced.

Rear Springs Underslung

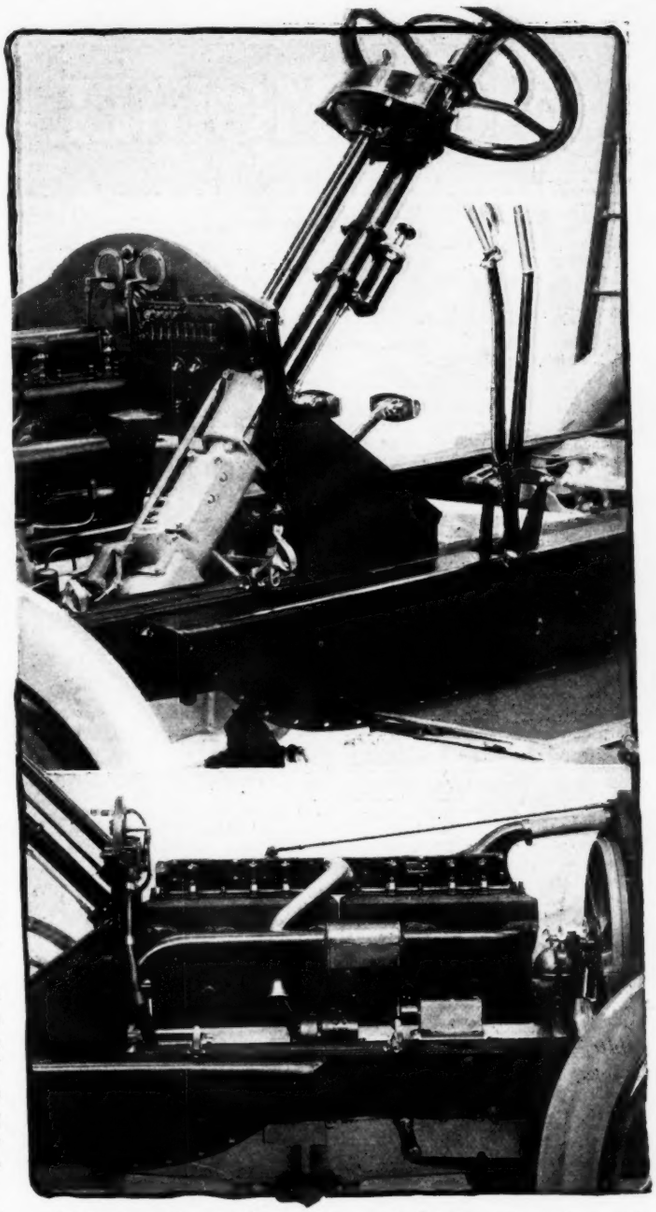
Another feature new to Packard construction is the underslinging of the three-quarter elliptic rear springs which allows the lowering of the frame somewhat, without altering the road clearance, thus making for greater stability.

Brake drums have come in for some of the changing, their diameter being increased to 17 inches in the new six. The brakes are of the conventional internal and external types.

Another alteration is the bringing of the brake rods within the frame, that is, they extend back from the equalizers to the rear axle within the frame instead of paralleling it along the outside as heretofore.

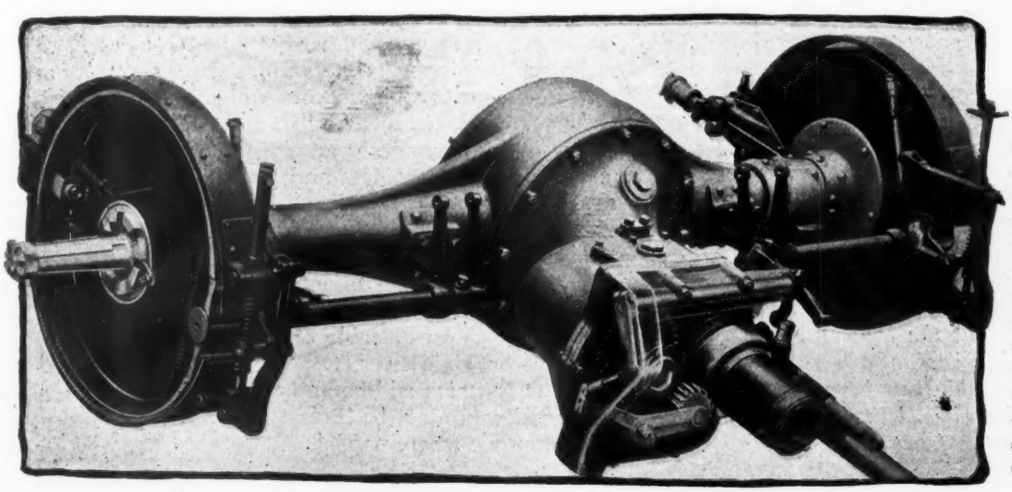
Left drive and control are used, as is also the control board on the steering column. The arrangement of the apparatus on this board has not been altered; however, the car incorporates a new gearshift, which, though of the progressive type, is of less lever throw. Both the brake and gearshift levers have been moved 8 inches forward from their previous position, allowing a door to be put on the drive side. The steering column now also carries the hand gasoline pressure pump, which last year was fastened to the front of the seat.

Reductions in price are also noted in the new 38. The touring car is listed at $3,850, which is $300 under this year's price, while corresponding reductions are made in other models. The chassis alone is listed at $3,100.



Upper—Mounting of steering column at the left rear of the motor, also oil filler for crankcase

Lower—Showing clean-cut appearance of right side of motor mounted in the chassis; note presence of valve cover plates



New Axle

Pressed steel axle housing used for the first time on Packard chassis; also brake operating rods supported on axle so that brake connection rods lie entirely within the frame members instead of outside of the side members as formerly. The new axle housing gives a more compact design than formerly and one which weighs approximately the same. The gearbox is a casting of the same design as formerly used

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Imitation and Progress

THE Greek philosophers held that an individual could work the greatest good to himself only in proportion as he was administering to the public welfare, recognizing as they did that inter-relationship between individuals and communities which is the basis of permanent progress.

This has an adaptation in the automobile field. Up to the present there has been a conspicuous lack of co-operation on the part of many car-building firms with organizations that have for their object the best interests of the industry. As a specific example our engineering societies are working for the general good of all automobile and accessory concerns, yet there are several of the engineers, who, while attending all of the sessions, positively refuse to engage in the discussions and to divulge a single practice used in their factory or a single detail of design. According to the Greek conception of true greatness and permanent progress, these people are on the wrong track, moving out of harmony with the great current of progress. Yet not a few of these engineers have been the largest imitators of foreign designs and have brought out few original ideas.

A review of the events of the last 5 years shows that those who locked themselves up in the cells of their own self-importance are not the leaders of today. In a word, they are traveling back of the real current of progress. Where else could they be when the be-all and end-all of their engineering ability is imitation? An imitator never moves in the front rank.

French Truck Tests

THE French army tests over 2,200 miles of road use at speeds of 19 or 20 miles per hour have taught their lessons not only to the French army, the French truck maker and the French truck buyer, but to the motor truck world. The tests have demonstrated conclusively that such speeds are beyond the possibilities of steel tires, and while steel tires find general use on the slower-moving vehicles in Paris, it is utterly impossible to use them on the good French roads when speed exactions are so high. The truck mechanisms will not endure such abuse. Real axle mechanisms will not hold up under such continuous strenuous treatment. Speed eliminated practically 50 per cent. of the contesting trucks.

These tests have been to the truck much the same as the long-distant road race is to the passenger car. It is the test supreme. It is the great discoverer of poor materials, materials unsuited to the job, and in the final analysis this is at the bottom of the majority of the failures in the better-known makes of French machines.

Never before have motor trucks been subjected to such a gruelling test. Not content with high-speed ability the rules called for hill-climbing in which one truck was required to tow another up a gradient. This revealed the weak points in clutches, discovered errors in gear ratio between motor and rear wheels and other details. To go further, carbureters were required to handle three different kinds of fuel without more than ordinary dash adjustment. Lastly, when the tests were over, the bodies of the trucks were removed, the cylinder castings were taken off, covers of gearboxes were removed, wheels were taken off, in fact, the trucks were really dismantled and measurements taken for undue wear, disqualification being the penalty imposed.

Changing France, who enjoys her new sensation every day in the year, has certainly set a new high-water mark for truck tests, and a good one. The army has got down to real business. It is along the lines of the early reliability trials in America when the final technical inspection at the end of the run took in every part of the chassis details. But France has gone further and has peered into the inner constructions.

France has set a new mark for us. Congratulations are hers. She has outdone herself, has thrown aside that gaudy garment of sensation and donned in its place one of realism, realism personified.

Our government could wisely imitate such a policy. Our army requirements are steadily growing. Our postal departments are in greater need than ever before. The government is spending its money in a hit-or-miss purchasing policy, openly admitting that it must experiment and that it considers purchasing from every corner of the country a good policy. The short-sightedness of such a policy was well shown in its first order for parcel post vehicles, which was later canceled. The original order contained large orders from concerns that have since ceased to exist and at the time the orders were placed were in an unstable condition. Let our government put on rigid tests, tests which will benefit every maker, tests which will be an advertisement to the country, and if we cannot be leaders then imitate France and try to improve where possible.

New Cheap Fuel Discovered in London

Benzol Can Now Be Made in Quantities of 40,000,000 Gallons Per Year from a Single Plant—High Temperature Process Secures 3 Gallons Per Ton of Coked Coal

NEW YORK CITY, Sept. 8—Cable dispatches from London announce the discovery of a new motor fuel, presumably benzol, which may be used satisfactorily as a substitute for gasoline, in that it can be sold at 28 cents a gallon as compared with petrol or gasoline which now sells in Great Britain at 42 cents. Heretofore benzol has not been considered seriously because there was little hope for its manufacture in large quantities, but, according to the cable dispatches, the extensive tests conducted by the Royal Automobile Club and other motoring organizations shows that there is a possibility for the production of 40,000,000 gallons per year, from a single plant. Arrangements are now under way for the erection of such plants.

Benzol as it will be produced is a by-product of coal obtained as a by-product from gas-making plants. Continued experiments with its manufacture have been carried on for 6 months and the British trade press has lent its influence towards the assistance of the movement. These tests have shown that benzol gave an average of 22 per cent. greater mileage per gallon than did gasoline when the carbureter is adjusted to give the best results for each, and that there is no more carbonization with benzol than with "petrol." The specific gravity of benzol is slightly greater than that of gasoline and the carbureter float has to be altered and usually a smaller nozzle is required for best results.

Benzol is a colorless, volatile and highly inflammable liquid of the hydrocarbon series. In appearance it is very similar to gasoline, but chemically there is a material difference, and it can be divided into various series, such as paraffin, olefines, and benzines.

Speaking generally the majority of benzols are mixtures of the three series mentioned in varying proportions, and they are obtained either by extraction from coal gas, or recovered from the distillation of tar. The various processes and plants in use are numerous and can be divided into high and low-temperature distillation processes. Temperatures approximating to 2,000 degrees F. are employed in the former, while in low-temperature series they range from 580 degrees F. to 950 degrees or 1,000 degrees.

The amount of benzol recovered by high-temperature processes varies from 2¾ to 3½ gallons per ton of coal coked. In low-temperature distillation the quantities are very largely increased.

Yellowish Appearance Is Bad

If, in appearance, the spirit is of water-white color, it is probably of good quality. A yellowish appearance argues caution, although under certain circumstances it may be quite suitable. The only safe way to prove whether a spirit be suitable or unsuitable is by means of a chemical test, which indicates the extent of the presence of coumarine. Coumarine is a dark, sticky, oily-looking substance, which, if present in the spirit, deposits itself on the valve stems near the heads, trickles down into the guides, and after a time "gums up" the valves, prevents their prompt return to their seats under spring pressure, and so renders the engine inefficient. A properly washed spirit has the harmful proportion of coumarine removed and can be used with complete success.

With the majority of carbureters benzol may be used equally as well as gasoline. When first using it, do not alter the carbureter. After a run of about 20 miles notice if there is any sign of extra heating about the engine generally, or if the exhaust gases are extra hot. If extra heat is observed, adjustment of the carbureter is needed. In carrying out any adjustment of this nature, although somewhat paradoxical, it is a practical truism that benzol gives better results on the less-benzol-to-the-same-air idea than it does on the same amount of spirit with more air. This is an argument, therefore, for reduction of jet orifice. At the end of the next 50 miles remove, say, a plug in one of the front cylinders and a valve cap in one of the rear ones. If there is anything in the nature of a sooty deposit, reduce the size of the jet orifice. At the end of the next 100 miles do the same, and so on until such a time as the right proportion has been obtained, and the car runs without any deposit of soot at all. These successive jet reductions should be very slight.

Should the exhaust be malodorous, that is, to a greater degree than with gasoline, and the smell be sulphurous, it argues in the direction of too high a sulphur content in the spirit. The committee is at present conducting experiments to determine the maximum amount of sulphur that can be permitted without producing unsatisfactory results, and although the tests are not yet completed, it would seem that anything up to 250 or even 300 grains of sulphur per gallon of spirit may be allowed, without a malodorous exhaust being produced, or any chemical action being caused on the metals of the engine.

As benzol is a stronger solvent than gasoline, temporary troubles may be caused by paint (from the inside of the tank), small pieces of rubber, etc., which were innocuous in gasoline being carried into the jet by benzol. If such troubles should occur, fill the tank with benzol over night, and empty it in the morning, through a strainer. Particular care should be taken not to spill the benzol in the coach work of cars, as it may attack the paint or varnish. Another feature is that the use of benzol will stop knocking in practically all cases where engines are inclined to knock on gasoline. The motorist must, therefore, bear in mind this fact and not hang on unduly to the top gear on hills just because he notices that the engine does not knock, otherwise excessive strain is being put on the bearings, gudgeon pins, etc.

The use of benzol permits of higher compression without causing pre-ignition or knocking. This point, perhaps, is of more intrinsic worth in connection with cars intended for racing purposes than for the ordinary motorist. The prevalent idea that an extra air valve is needed with benzol is not correct. With the older type of carbureter an extra air inlet may prove advantageous, but it is preferable to go on on the lines of jet reduction with the same air inlet than to try to use the same quantity of spirit with additional air. In addition to reducing the size of jet orifice, it is also desirable to raise the level of the spirit in the jet in order that it will flow more easily, thereby facilitating efficient carburetion. This can be done in a number of ways, one of the simplest being to add to the weight of the float by putting a little solder on the top. In doing this care should be taken to add the solder in a manner not to interfere with the efficient working of the toggles.

It has been estimated that about 100,000,000 gallons of fuel are now being consumed annually in England, Scotland, Ireland and Wales, so that with the possibilities of benzol being manufactured in quantities to meet practically this entire demand, the fuel situation in Great Britain has reached a crisis never attained before in its history. The magnitude of this is appreciated as the price of benzol is 16 cents under the present price of gasoline, which alone gives an economy of $16,000,000 per year to the motor owners.

Europeans To Standardize Chassis

PARIS, Aug. 20—European automobile manufacturers, through the medium of their international trade association, are endeavoring to standardize chassis dimensions with a view to simplifying the work of bodybuilders. At the last meeting of the International Union of Automobile Manufacturers, just held at Geneva, a proposal was brought forward for the standardization of three distinct classes of car chassis to receive respectively two, four and six-passenger bodies. Under this proposal the length and width available for the body, the kick-up of the chassis, the position of brake and change speed levers and the inclination of steering column will all be standardized, so that it will be possible for a bodymaker to build a body to fit an A, B, or C class chassis without even having seen the chassis. The proposal has been submitted to the entire European trade and will be reported on at the next meeting of the International Union. It is quite possible that there will be detail modifications, but its official adoption is expected within a year. Under the European plan of having automobile bodies built by specialists quite distinct from the chassis manufacturer, this arrangement will allow the bodymakers to produce their new models during the slack season without having to wait for the chassis to be handed over to them. There will also be an interchangeability of bodies which will be of immense advantage to the car owner.

Grout Factory Is Sold

ORANGE, MASS., Sept. 5—What has often been claimed to be the first building ever erected in this country to be devoted exclusively to the manufacture of motor cars, the old Grout factory, was sold at auction yesterday and so ends the company. The plant has seen stormy times and for 7 years it has been the subject of litigation. The sale was made by order of the receivers and there were many people present from Boston, Springfield, New York and other places. The plant was sold in four parts. The real estate, including two large factory buildings with machinery, and adjoining shed and a two-story house, was bought by the Orange National Bank for $19,010. The property carried a mortgage for $2,100 plus $900 interest, making a total of $22,010.

Nine motor cars, some new and some second-hand, were sold to different parties and brought $3,500. The automobile barn was bought for $2,100 by Arthur Kirkpatrick of Orange, for some years sales manager of the company.

President F. A. Dexter of the Orange National Bank stated after the sale that the bank expects to sell the plant to a new firm looking for a location in Orange. It is not an automobile company. Mr. Kirkpatrick is undecided whether he will continue making parts for the Grout cars that are now in use or devote his purchase to something else.

Court Limits Re-Issue Delay in Patent Suit

Ashcroft Mfg. Co. Wins from Special Machine Co. in Suit Over Valve-Grinding Machine Patents

NEW YORK CITY, Sept. 7—Judge Holt in the United States District Court for the District of New York, has rendered a decision covering the permissible interval between an original patent and a reissue patent for a valve grinding machine. It has been held that in the absence of special circumstances, a re-issue should not be granted after a delay of more than 2 years. As the Specialty Machine Co., in its suit for infringement brought against the Ashcroft Mfg. Co., could not show any good reasons for the long delay, its patent claims were held invalid and a decree was rendered for the defendant company.

On March 26, 1907, Robert H. Hazeltine filed an application for patent No. 918,049, and assigned by him to the Specialty Machine Co., of New York City, and while this was pending, on March 23, 1908, filed another application, the same as on March 26, 1907, with additional features and improvements. On April 13, 1909, the two patents, 918,049 and 918,050, were granted to Mr. Hazeltine. On Feb. 7, 1912, he surrendered patent No. 918,049, and applied for a re-issue, which was granted on May 21, 1912, No. 13,421. Upon this re-issue patent this suit was brought, infringing claims 8, 9 and 10 of the patent. Between the time of the issue of patent No. 918,050 and the re-issue, No. 13,421, a patent had been granted to one Blanchard, which in some phases was the same as the Hazeltine patents. Mr. Hazeltine then asked that his patent, No. 918,049, be cancelled and that a re-issue patent be granted him. In his application for a re-issue patent he corrected some of the claims of the first patent, thus making the Blanchard patent an infringement. After obtaining the re-issue patent he brought suit for infringement against the Ashcroft Mfg. Co., which was manufacturing valve-grinders under the Blanchard patent.

In rendering his decision, Judge Holt told about the early history of the valve-grinding machinery, proving Hazeltine's "invention" invalid and anticipated.

"The machine patented is a machine for reseating valves," said the judge, "and is used particularly for grinding and reseating automobile valves. Valves and cocks for preventing the passage of water, gas, or steam must, of course, fit tightly. When they leak the two parts must be ground down so as to fit exactly. That was originally done by hand. Emery or some abrading substance was applied to the valve, and the valve revolved in its seat. If the revolution of the valve was continuous it was found that the valve would be ground unevenly, and it was always the practice in grinding valves to do it with a reciprocating motion, turning them first a certain distance in one direction, and then back. It was also found that if the two distances were equal there was a liability to creat a ridge or shoulder on the valve or its seat. So that the practice in grinding valves by hand was to move the valve back and forth a few times, then turn it a little in its seat, and then renew the grinding. Machines were long ago devised to do this work, based on the idea of having a cylinder, the end of which ground the valve, placed between two revolving disks, each of which had on the interior mutilated cogs or frictional surfaces, so arranged that the cogs or frictional surfaces would alternately engage the cylinder. By this method a continuous rotation given the disk imparted a reciprocating motion to the cylinder. The fundamental idea is clearly shown in the patent to Millingar, which states that either cog gearing or friction wheel can be used. This device gave the reciprocating motion, and by making some of the mutilated cogs or friction wheels of unequal length the result was obtained of having the point at which the grinding began moved forward at each complete revolution of the disks."

Complains That Motz Tire Infringes

NEW YORK CITY, Sept. 7—A bill of complaint has been entered in the United States District Court, Southern District of New York, by Edwin B. Cadwell, F. P. Johnston and F. M. Ashley, against the Motz Tire & Rubber Co., its officers, agents and servants, claiming an infringement of patent No. 887,997. This patent involves certain improvements in vehicle tires. Mr. Cadwell, the inventor of this patent, assigned to Messrs. F. P. Johnston and Ashley, giving them a one-third interest in the application for the patent. The plaintiffs have prayed for an injunction and preliminary injunction pending the suit, restraining the defendant, etc., from infringing the said claims of the letters patent, also, for costs and account of profits and damages, and that said damages possessed may be trebled.

Klaxon Sues Boston Car Distributor

BOSTON, MASS., Sept. 10—Suit has been filed this week in the United States District Court of Massachusetts by the Lovell-McConnell Manufacturing Co., Newark, N. J., against the Henley-Kimball Co., of Boston, distributers of Hudson cars, for infringement of letters patent Nos. 923,048-923,049 and 923,122, granted May 25, 1909. It is understood that the special infringement complained of consists in promoting sale of the Hudson car by offering and selling as standard equipment an alleged infringing warning signal known as the Sparton, made by the Sparks-Withington Co., Jackson, Mich. The attorney for the Klaxon company, Geo. C. Dean, states that other suits will follow.

NEW YORK CITY, Sept. 10—On September 5, the United States District Court for the Southern District of New York, granted various motions of Lovell-McConnell Mfg. Co., in its suits against the Square Motor Horn Co., and the Salvini Electric Horn Mfg. Co., makers of the Square horn for infringement of patents Nos. 923,048, 923,049 and 923,122. By court order of that date the parts of the defendants' answers seeking to bring in the Hutchison Electric Horn Co., and Miller Reese Hutchison; setting up as a defense an alleged patent application owned by the defendant; and setting up the pending suit of the Lovell-McConnell Mfg. Co., against the manufacturers of the Newtone horn now pending in Brooklyn and awaiting the decision of his honor Judge Chatfield, were stricken from the answers.

In addition to the orders striking out these portions of the answer there was a further order cutting down the 175 United States patents, fifty-nine foreign patents and seventeen printed publications set up in the answer.

Bankruptcy Proceedings for Cutting

DETROIT, MICH., Sept. 10—*Special Telegram*—When the sale of the property of the Cutting Motor Car Co., Jackson, Mich., came up for confirmation in the District Court on September 9 and Judge Sessions failed to confirm the sale to W. M. Thompson, president of the Jackson City Bank, who offered the sum of $30,000 in cash and agreed to assume mortgages for a like amount, several of the larger creditors were opposed to the sale, claiming that the figure was not large enough and that in addition to the fact that a petition in bankruptcy has been filed against the concern led to the action of the court. If the larger creditors do not decline, the usual bankruptcy proceedings will be carried out. The Cutting concern recently filed a denial of bankruptcy but the Security Trust Co., receiver of Detroit, advises a withdrawalof this denial so as to hasten the proceedings.

To Sell R. C. H. Property

DETROIT, MICH., Sept. 10—*Special Telegram*—At a meeting yesterday of ninety creditors of the R. C. H. Co., a motion was passed authorizing the receiver, the Security Trust Co., of this city, to proceed to a formal sale of the entire property. This action was based on report of the business made by the receiver since taking hold of the factory, the report showing that during this term 200 cars had been shipped. The creditors present decided that with this small output it was impossible to operate the plant at a profit under the receivership and the motion to proceed with the sale was the offered solution. The sale procedure will take about 6 weeks.

Only One Bidder for Flanders Plants

DETROIT, MICH., Sept. 10—The public auction sale of the plants of the Flanders Mfg. Co. at Pontiac and Chelsea, Mich., which were held on September 8 and 9, brought only one bidder, the Harris Bros., Detroit. At the time of the closing of the Flanders plants Harris Bros. took options on the properties looking forward to buying them at this sale. Sixty-five thousand dollars was offered for the real estate at Pontiac, although no bids whatever were received on the Chelsea property.

Midland Sale September 23

EAST MOLINE, ILL., Sept. 2—The sale of the Midland Motor Co., which was reported in last week's issue, will take place at public auction at Peoria, Ill., Sept. 23, at 10 a. m. in the Peoria courts in accordance with the ruling of the referee in bankruptcy. The property will be offered in parcels and in bulk, and will be sold as it is on the day of the sale. Successful bidders must deposit 10 per cent. of the amount bid with the trustee at the time of sale and pay the balance of their bids on confirmation of sale by the referee. The trustee will file a report of the sale with the referee at Peoria, September 25.

Mack Cuts Prices 20 Per Cent.

NEW YORK CITY, Sept. 7—Mack truck chassis were reduced in price approximately 20 per cent. today by the International Motor Co., this city, the entire list of models being revised. At the same time that this announcement was made the company made it known that hereafter these trucks would be sold on the instalment plan, 25 per cent. of the purchase price to accompany the order and the balance to be paid in twelve monthly payments. In a cash purchase of a truck 6 per cent. discount is given. The only reason given for this price reduction is that the company is going out after more business.

HARTFORD, CONN., Sept. 10—Arrangements have been completed for the continuance of the repair department of the Columbia Motor Car Co., the main plant of which is discontinued by the Max-

well Motor Co. In order that Columbia car users may be cared for the Columbia Auto Repair Co. has been formed. William P. Welch, who has been superintendent in the main shops, Edward Copeland and Thomas Hughes will conduct the affairs of the new organization. Mr. Hughes states that arrangements have been made whereby the new company will be able to make use of the factory repair department for the next 3 months, after which other arrangements may be made.

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Buick Brings Out Six for 1914

DETROIT, MICH., Sept. 10—For 1914, the Buick name will be borne by a six-cylinder machine as well as by a line of fours which with considerable alteration supersede those of last season. The new six retains the characteristic Buick overhead valve motor. The bore is 3¾ inches and the stroke 5 inches. With this long-stroke powerplant, brake tests are said to show that the car possesses 48 horsepower. This car as well as all of the fours is equipped with a Delco combination ignition, cranking and lighting system. It has a wheelbase of 130 inches and there are two body types, a five-passenger touring car and a roadster. Left-side drive and center control are used. The bodies are in accordance with the latest dictates of body fashions, full curved rear fenders, clean running boards, smooth-sided design with concealed door hinges and handles, sloping hood and cowl shaped to meet it being among the features. The price of this model B55, as the new Buick is designated, is $1,985.

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Paiges for 1914 Retain Distinctive Features

DETROIT, MICH., Sept. 10—The Paige-Detroit Motor Car Co. enters the 1914 season with its same two representatives, models 36 and 25, both with four-cylinder block-cast motors. The changes made are principally in the nature of refinements and do not affect the important features of the cars at all.

The type 36, which is offered for $1,275 with full equipment, including a Gray & Davis two-unit electric cranking and lighting system, has a 4 by 5-inch motor, L-head design. The gearset is in unit with the crankcase, making a unit powerplant construction. For the 1914 season this larger car, the feature of the line, is built in five models all on the 116-inch wheelbase.

Like the model 36, the 25 has an L-head motor and the unit powerplant feature. This motor has a 3¾-inch bore and its stroke is 4 inches. The wheelbase is 110 inches, and on this chassis a five-passenger body only is offered. The price is $950, electric cranking and lighting being added for $75 extra. The equipment is complete.

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Harry Endicott Killed in Practice

JACKSON, MICH., Sept. 5—Harry Endicott, one of the most prominent of American race drivers, was killed here this afternoon when his car went through the fence at the local track, where he was training for a meet. The car struck and killed a little girl and injured two other persons.

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Two Records Go at Minneapolis

MINNEAPOLIS, MINN., Hamline Track, Sept. 6—Thirty thousand racing devotees of the high speed game fringed Hamline mile track where some of the best drivers of the country contested. Two track records were broken, and four spills, none of them serious, marked the closing day of the Minnesota State Fair. The track was fast, and comparatively free from dust.

Louis Disbrow broke the track record for 4 miles when he won the 5-mile free-for-all in 4:26:05. Endicott was a good second and Rainey, third. Rickenbacher started in the event and it came near being his last. His car skidded, struck a post, whirled end for end and in the crash broke off four fence posts. The car then turned completely over on the inside of the track, but the driver was firm in his seat. Rickenbacker crawled from under the wrecked car, bruised, but not seriously hurt.

S. LaBarre had previously skidded and his Pope-Toledo had gone through the fence. It did not turn turtle and the driver was not injured seriously.

In the final race, a 5-mile event, Disbrow won, his time being 4:26:05, and his fastest mile, 49:20.

Automobile Securities Quotations

No changes of importance took place in this week's stock prices. The changes that did take place were of little import. The common of the Pope Mfg. Co. rose 1 point, while the Consolidated Rubber Co. common rose 3 points and its preferred dropped 4 points; the common stock of the General Motors Co. dropped 1 1-2 points, while that of the Goodyear Tire & Rubber Co. rose 5 points. The Miller Rubber dropped 3 points, while both the common and preferred of the Peerless Motor Co. rose 1 point.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	150	165	150	170
Ajax-Grieb Rubber Co., pfd	95	100	95	100
Aluminum Castings, pfd	99	102	98	100
Chalmers Motor Company, com	..	..	100	108
Chalmers Motor Co., pfd	..	..	97	102
Consolidated Rubber Tire Co., com	13	16	31	33
Consolidated Rubber Tire Co., pfd	50	60	92	93
Firestone Tire & Rubber Co., com	279	283	265	270
Firestone Tire & Rubber Co., pfd	106	108	102	104
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	..	..
Garford Co., pfd	99	101	92	95
General Motors Co., com	39	40	35	37
General Motors Co., pfd	80	82	79	81
B. F. Goodrich Co., com	80	81	28	29
B. F. Goodrich Co., pfd	108	109	89⅛	90
Goodyear Tire & Rubber Co., com	332	336	275	285
Goodyear Tire & Rubber Co., pfd	105½	106½	98	99½
Hayes Manufacturing Co	..	93	..	..
International Motor Co., com	27	28½	..	5
International Motor Co., pfd	84	85	10	18
Lozier Motor Co., com	..	..	16	..
Lozier Motor Co., pfd	..	..	..	90
Maxwell Motor Co., com	..	..	3¾	4½
Maxwell Motor Co., 1st pfd	..	..	28	32
Maxwell Motor Co., 2d pfd	..	..	7	9
Miller Rubber Co	..	145	132	137
Packard Motor Co., pfd	105½	107	..	99
Peerless Motor Co., com	..	..	33	40
Peerless Motor Co., pfd	..	..	87	90
Pope Manufacturing Co., com	39	40	9	11
Pope Manufacturing Co., pfd	73	74	29	33
Portage Rubber C com	..	..	35	40
Portage Rubber Co., pfd	..	..	85	90
Reo Motor Truck Co	9	10½	10	10¾
Reo Motor Car Co	22	24	16	17½
Rubber Goods Mfg. Co., pfd	..	..	102	106
Studebaker Co., com	44	45	22	24
Studebaker Co., pfd	94½	95¼	80	86
Swinehart Tire Co	98	100	84	86
U. S. Rubber Co., com	..	..	60½	61
U. S. Rubber Co., 1st pfd	..	..	106	106½
White Co., pfd	107	109	104	107
Willys-Overland Co., com	..	..	62	64
Willys-Overland Co., pfd	..	..	83	92

Market Changes of the Week

A few changes of small importance occurred in this week's markets, the most important being the drop of tin to $42.65 a ton, at a lowering in price of $1.05. This was due to a reaction which took place on Tuesday in the local market. There was little business either on domestic or foreign account. Heavy realizing in standard copper at London on Tuesday resulted in a sharp break in prices of warrants and was followed by lower prices for electrolytic, both here and abroad. Electrolytic copper had a very fluctuating week of it and closed at a gain of $0.00 1-2 per pound in price, a break, however, taking place at the last quotation.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb	.07½	.07½	.07½	.07½	.07½	.07½	.....
Beams & Channels, 100 lbs	1.61	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton	25.00	25.00	25.00	25.00	25.00	25.00	.....
Copper, Elec., lb	.16	.15 3/10	.15⅞	.15⅞	.16⅛	.16½	+ .00½
Copper, Lake, lb	.16⅛	.16⅜	.16	.16	.16¼	.16⅜	— .00½
Cottonseed, Oil., lb	8.46	8.43	8.20	8.22	8.10	8.11	— .35
Cyanide Potash, lb	.19	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 gals	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard, Oil, prime	.95	.95	.95	.95	.95	.95	.....
Lead, 100 lbs	4.75	4.75	4.75	4.75	4.75	4.75	.....
Linseed Oil	.53	.53	.53	.53	.53	.53	.....
Open-Hearth Steel, ton	24.00	24.00	24.00	24.00	24.00	24.00	.....
Petroleum, bbl., Kansas crude	1.03	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Silk, raw Italy	....	5.30	....	....	5.30	5.30	.....
Silk, raw Japan	....	4.30	....	....	4.25	4.33	+ .03
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb	43.70	44.00	43.50	43.00	42.88	42.65	—1.05
Tire, Scrap	.09½	.09½	.09½	.09½	.09½	.09½	.....

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Couzens Is Ford Vice-President

DETROIT, MICH., Sept. 10—*Special Telegram*—James Couzens, formerly secretary and treasurer of the Ford Motor Co., has advanced to the vice-presidency, succeeding John F. Dodge, resigned. Mr. Couzens still retains the treasurership. Frank L. Klingensmith, former cashier, who has been with the Ford company about 8 years, becomes secretary.

FORD Building Has Giant Sign—Topping the new five-story addition of the Ford factory at Jackson avenue and Honeywell street, Long Island City, N. Y., which has recently been opened to relieve the original building built a few years ago, is an electric sign lighted for the first time recently and which ranks with the largest signs in Greater New York. Eleven letters forming the name Ford Motor Co., each 17 feet high, blaze out against the sky and can be seen distinctly from the Manhattan side of the East River. The sign is 200 feet long and built on a steel structure exceptionally heavy to withstand the high wind, in addition to sustaining the great weight. The base of the letters is 27 feet above the roof level and the supporting frame is built in such a way as to permit maneuvering automobiles, for even the roof of the plant is utilized. The eleven letters are studded with 650 Tungsten 10-watt sign lamps, which reflect a brilliant light from the white background of the letters.

Pontiac Castings Adding—The Pontiac Motor Castings Co., Pontiac, Mich., is adding a 50 by 60-foot building to the present plant. The new structure will be of uniform construction with the main building.

Cleveland Spring Builds—The Cleveland Spring Co., Cleveland, O., has secured a site on Chestnut Avenue and will build a factory for manufacturing automobie springs.

Factory for St. John—A factory is to be erected at St. John, N. B., to manufacture oil engines for local and export trade, by the Oil Motor & Mfg. Co., Ltd., newly organized.

Rubber Factory for Brazil—J. C. MacFadyean of the Goodyear Tire & Rubber Co., of South America, has left for Brazil to supervise construction of a $1,300,000 rubber factory at Rio Janeiro.

Beaver State Co.—The Beaver State Motor Co., Portland, Ore., has bought a 5-acre site near Gresham for an automobile manufacturing plant. The first building will be 60 by 200 ft. and will cost $25,000.

Takes Part of Chevrolet Plan—The Sterling Motor Works, Detroit, Mich., has taken over a portion of the factory formerly occupied by the Chevrolet Motor Co., and will manufacture motors for cyclecars.

Purchases Bowling Green Plant—F. B. Rohtert, Nashville, Tenn., has purchased the plant of the Roemer-Worrick Foundry & Machine Co., Bowling Green, Ky., and will add materially to its equipment.

Lord Baltimore's Canton Plant—The Lord Baltimore Truck Co. has had plans prepared for the construction of a large automobile plant at Canton, O. The main building is to be 125 by 600 feet and two stories high.

Stevens-Duryea Capacity Doubled—The capacity of the Stevens-Duryea Automobile Co.'s plant at East Springfield, Mass., is to be doubled with a large addition in Cottage street. Tentative plans are under consideration.

London Firm in St. Johns—The Hartt Accumulator Co., of London, England, will establish a plant in St. Johns, Que., for the manufacture of electrical supplies may possibly concentrate its Canadian business there.

Koogle Manufacturing Auglaize Truck—The Koogle Auto Co., Indianapolis, Ind., has arranged to build and market the Auglaize motor truck now manufactured at New Bremen, O. A two-story factory building is to be erected.

Canadian Co. Starts Soon—The Canadian Brake Shoe Co. will shortly commence operating in Sherbrooke, Que. It will make steel and brass forgings by electricity and will be the first plant of the kind in Canada. Prominent Toronto men are behind the company.

Peerless Co. Enlarges Plant—The Peerless Insulated Wire & Cable Co., Pennington, N. J., will in the near future enlarge its plant and it is now adding more machinery. While fifty hands are given employment at the plant at the present time the number will be increased within a few months.

Castle Lamp in Toledo—The Castle Lamp Co., Battle Creek, Mich., has moved to Toledo, O., establishing a factory on a site furnished by the Willys-Overland Co. within a short distance of the latter's plant. The plant employs nearly 200 skilled workmen, many of whom moved from Battle Creek to Toledo with it.

Hazard Increasing Facilities—The Hazard Motor Mfg. Co., Rochester, N. Y., is increasing its manufacturing facilities by the erection of a new building 60 by 130 ft. and by the purchase of additional machine tools. One part of the new building will be used for a block test room, the area of which will double the present test room space. The remainder of this building will be used for stock and shipping rooms. The space in the present factory previously used for test and stock rooms will be made a part of the production departments, increasing the space in both assembling and machine departments over 30 per cent. These various changes will enable the Hazard company to build a maximum quantity of 5,000 motors per year. At the present time several departments are running 20 hours per day to keep up with orders.

The Automobile Calendar

Shows, Conventions, Etc.

Sept. 17-18.....Cleveland, O., Annual Meeting of the National Brick Manufacturers Assn.
October 13.....Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.
Oct. 27-28.....Chicago, Ill., Convention of Electric Vehicle Association of America.
Oct. 27-28.....Chicago, Ill., Fourth Annual Convention, Electric Vehicle Assn. of America.
Dec. 9-12.....Philadelphia, Pa., Annual Convention of American Road Builders' Association.
Dec. 11-20.....New York City, First International Exposition of Safety and Sanitation, under the auspices of the American Museum of Safety.
Jan. 3 10, 1914.....New York City, Automobile Show, Grand Central Palace.
Jan. 24-31, 1914....Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 26-31, 1914....Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.
Jan. 31-Feb. 7, 1914.Minneapolis, Minn., Automobile Show.
Feb. 2-7.....Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14.....Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb. 21-28.....Newark, N. J., Automobile Show, N. J., Auto Trade Assn.
Feb. 22-March 5....Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.

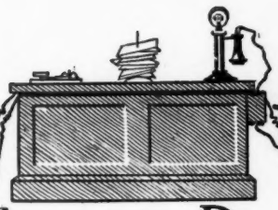
Race Meets, Runs, Hill Climbs, Etc.

Sept. 8-13.....Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Sept. 9.....Corona, Cal., Track Race, Corona Automobile Assn.
Sept. 12.....Canfield, O., Track Meeting, Canfield Fair Assn.
Sept. 13.....Covington, Ky., Track Meeting, Cincinnati Automobile Club.
Sept. 13.....Grand Rapids, Mich., Track Races, Grand Rapids Automobile Club,
Sept.14.....Seattle, Wash., Track Meet, Kings Co. Fair Assn.
Sept. 18.....Asheville, N. C., Hill Climb, Asheville Automobile Club.
Sept. 20 21.....Detroit, Mich., Track Races, Michigan State Fair.
Sept. 27.....White Plains, N. Y., Track Meet, G. T. Long.
Sept. 27-28.....Bakersfield, Cal., Track Races, Kern Co. Fair Assn.
Oct. 3.....Trenton, N. J., Track Meet, Inter-State Fair Assn.
Oct. 3-4.....Oklahoma City, Okla. Race Meet, Oklahoma State Fair Assn.
Oct. 4.....Fresno, Cal., Track Meet, Fresno Co., Agricultural Society.
Nov. 2-3.....Los Angeles, Cal., Road Race, Los Angeles to Phoenix, Tex.
Nov. 4-5.....El Paso, Tex., Road Race to Phoenix, Ariz.
Nov. 4-5.....Los Angeles, Cal., Road Race to Phoenix, Ariz.
Nov. 4-5.....San Diego, Cal., Road Race to Phoenix, Ariz.
Nov. 6.....Phoenix, Ariz., Track Meeting, State Fair.
Nov. 24.....Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27.....Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

Sept. 21.....Boulogne, France, 3-Litre Race.
Sept. 25.....Isle of Man, International Stock Car Race.
October 17-28.....Paris, France, Automobile Show, Grand Palais, 10 days.
November 7-15.....London, Eng., Annual Automobile Exhibition, Olympia.

The Week in the Industry



Engineer — Dealer — Repairman — Garage

PATHFINDER ACTIVE IN WEST—A move of importance in connection with the plan of the Motor Car Mfg. Co., of Indianapolis, Ind., to enlarge its selling organization and improve its representation in the larger cities all over the country is noted in the activity of the newly organzed Pathfinder-Pacific Motor Sales Co., of San Francisco. The Pathfinder Motor Car Co. of Los Angeles, which formerly maintained the agency at San Francisco, is concentrating all of its efforts on the territory in southern California and will maintain exclusively its branch at Los Angeles. The San Francisco company has installed an elaborate service department and has on hand $10,000 worth of extra parts. The new company will retain its quarters at Fresno, Watsonville, Oakland and Sacramento and will establish service stations in all parts of the state, and also will have a branch in the Hawaiian Islands and Reno, Nev.

ROBINSON KISSEL MANAGER—A. S. Robinson has been made manager of the Pacific Kissel Kar branch in Los Angeles, Cal.

GENTRY WITH MCGRAW TIRE—H. C. Gentry joined the McGraw Tire & Rubber Co., New York City, in the capacity of sales agent.

SCHEU INVADER SALES MANAGER—E. A. Scheu has been appointed general manager and sales manager of the Invader Oil Co., New York City.

MOVES INTO NEW GARAGE—The Hornberg Automobile Co. recently moved into its large new garage at First avenue and Adams street, Spokane, Wash.

RAY HARROUN OPENS SALESROOM—Ray Harroun has opened a display and salesroom at 527 North Capitol avenue, Indianapolis, Ind., for the Harroun kerosene carbureter.

FULTON APPOINTED MANAGER—H. J. Fulton has been appointed northwest district manager of the Hudson Motor Car Co., with headquarters in Seattle, Wash.

SMITH AMERICAN VICE-PRESIDENT—F. E. Smith has become vice-president of the American Motors Co., Indianapolis, Ind.

MILLER RESIGNS FROM WINTON—G. W. Miller has resigned from the Winton M. C. Co., Seattle, Wash. A. G. Shaefer is at present acting manager.

FRISCO PATHFINDER MOVES—The Pathfinder Pacific Motor Sales Co. has moved into its new home in San Francisco, Cal., at Van Ness avenue and Pope street.

SHANKS LEAVES KELLY TRUCK—C. B. Shanks, general sales manager, has severed his connections with the Kelly-Springfield Motor Truck Co., Springfield, O.

WHITE MANAGES ESTERLINE SALES—W. Mck. White has been appointed sales manager of the Esterline Co., Indianapolis, Ind. His headquarters will be at the factory.

IN NEW QUARTERS—The Brady-Murray Motors Corp., metropolitan distributor of the Chandler car, is now in its new quarters at 245 West 55th street, New York City.

NOBLIT MINERVA SALES MANAGER—W. H. Noblit has been appointed sales manager of the Minerva Motor Co., of Pennsylvania, at 2116 Market street, Philadelphia, Pa.

LANCIA EQUIPPED WITH RUSHMORE LIGHTING—The Rushmore Dynamo Works, Plainfield, N. J., will equip Lancia cars for next year with its starting and lighting system.

MERCHANTS' ASSOCIATION'S YEAR BOOK—The Merchants' Association of New York, New York City, recently issued its 1912 year book. A classification of the members of the association by trades, or lines of business, is given.

HEASLET PROMOTED—J. G. Heaslet has been placed in general supervision of all Studebaker Corporation automobile manufacturing in Detroit, Mich., in addition to his position as head of the engineering and designing departments.

TAKES BAKER RIM AGENCY—The Pioneer Tire Repair Co., Minneapolis, Minn., has established a rim depot at 98 11th street, south. The company has taken the agency of the Baker rims and Ford wheels with the rims attached.

BENNETT VICE-PRESIDENT—W. M. Bennett, for the past 2 years vice-president and general manager of the International Electromotive Co., has been made vice-president of the Gramm Motor Truck Co., of Canada, Ltd., Walkerville, Ont.

BRADLEY DIRECTS MOLINE ADVERTISING—The Moline Automobile Co., East Moline, Ill., has appointed L. M. Bradley to direct the advertising campaign and assist sales manager C. H. Van Dervoort in building up the sales organization.

CULVER GOES TO STODDARD—C. R. Culver, sales manager of the Knox Automobile Co., Springfield, Mass., has resigned to become sales manager of the Stoddard M. C. Co., of that city, handling the Pierce-Arrow car and Selden motor trucks.

BROOKLYN AUTOMOBILE SERVICE BUILDING—The Cadillac Motor Co. is having plans prepared for a fireproof seven story automobile building for a plot 100 by 60 feet in size, to be erected at Lafayette avenue and Rockwell place, Brooklyn, N. Y.

OVERLAND IN NEW HOUSTON QUARTERS—The Overland Automobile Co., Houston, Tex., has secured a new salesroom at 908 Main street. It has also secured a building, 125 by 275 feet in size, at 1813 San Jacinto street. This will be used as a service station.

FUNDERBURK NEW SALES MANAGER—Otis Funderburk, formerly Michigan manager for the Rayfield carbureter, has been appointed sales manager of the carbureter division of the Detroit Lubricator Co., Detroit, Mich., which is making the Stewart carburetor.

NEW CADILLAC HOME—The Western Massachusetts Cadillac Co., with headquarters at Springfield, Mass., has just purchased a tract of land on Winter street in that city where it will erect a structure 100 by 150 feet for salesrooms and service station.

SCEARSE SEATTLE METZ MANAGER—J. P. Scearse has been made manager of the direct factory branch of the Metz Co. established in Seattle, Wash., which will be the distributing center for the Pacific Northwest states and the province of British Columbia.

BROWNE COLUMBUS BUGGY SALES MANAGER—L. M. Browne, formerly connected with the sales department of the Columbus Buggy Co., Columbus, O., has been made sales manager of the concern under the creditors' committee which is operating the plant.

SILVER TAKES PARTNERS—C. T. Silver, the New York City Overland agent, took into partnership C. C. McGregor and C. N. Dow, managers of his Brooklyn and Newark branches, respectively. Each will have a 40 per cent. interest in the business of his respective district.

GOES WITH ENDURANCE COMPANY—The Endurance Tire & Rubber Co., of New York City, is to open a New England branch with headquarters in Boston, Mass., and John L. Hamilton, formerly with the Eagle Oil & Supply Co., in that city, his been appointed manager.

WHITE SELLS 81 TRUCKS—The White Co., Cleveland, O., recently made a record sale to the Kaufmann-Baer Co., Pittsburgh, Pa. Twenty additional trucks will be delivered after the first of the year. This makes 160 White trucks delivering the purchases of Pittsburgh shoppers.

BRADLEY ASSISTANT SALES MANAGER—L. M. Bradley, formerly connected with Willys-Overland Automobile Co., Toledo, O., has accepted a position of assistant sales manager for the Moline Automobile Co., of East Moline, Ill. Mr. Bradley assumed his new duties the first of September.

PACKARD ADDS TO SERVICE STATION—The Packard Motor Co., New York City, will erect a new brick one-story addition to its service station on Hill street, near Queens Boulevard, to cost $40,000. It will be one story, of brick and concrete, 227 by 89 feet in size and adjoining the present building.

NEW DEPARTURE'S BALL BEARING MANUAL—The New Departure Mfg. Co., Bristol, Conn., recently issued a booklet, called the New Departure Ball Bearing Manual, for automobile dealers and garages. It contains suggestions on removing and replacing ball bearings, lubrication and enclosure, proper maintenance, cleaning, etc.

NEW SOUTHERN PACKARD BUILDING—The Abbott Automobile Co., agent for the Packard in New Orleans, La., is erecting a building of its own. The new structure, specially designed for the handling and display of automobiles, is the most pretentious building of its kind in the South. It will be ready for occupancy late in the Fall.

LEASES FIVE-STORY BUILDING—Through increased business the Syracuse Rubber Co., Syracuse, N. Y., has leased the five-story brick building next its present location. Doorways will be cut through from each floor and the additional floor space, combined with an increase in the number of salesmen, will make this the largest accessory house between New York and Chicago.

CHALMERS AGENT'S NEW QUARTERS—F. L. Caulkins & Co., of Middletown, Conn., who have the Chalmers agency for Hartford County, have secured the quarters on Ann street occupied by Skinner Bros., the former Chalmers representatives. The Stevens Duryea branch in the adjoining store has leased the basement of the Chalmers salesroom and will extend the repair department.

ST. LOUIS FIRM BUILDS—The Halsey Automobile Co., St. Louis, Mo., will erect a sales building to be three stories high. It will be fireproof, of reinforced concrete, 100 by 150 feet in size, and will have passenger and freight elevators, their capacities being 15,000 pounds. The first two floors will be for showrooms and the top will be used for a machine shop. The total cost will be $100,000.

CADILLAC'S CLEVELAND STRUCTURE—In erecting the four-story building at 1925 Euclid avenue, Cleveland, O., for the use of the Cleveland Cadillac Co. as an automobile salesroom and service station, foundations are being put in for an eight-story structure, which eventually will be required by the Cadillac people. Plans for the first four stories are ready, and it is understood work will commence at once.

SERVICE PLANT FOR GARFORD—A garage and service station is being erected by the R. & L. Co., eastern distributor of the Garford cars and trucks, at 150th street, Gerard and River avenues, New York City. The new building will be 200 feet long and 189 feet wide, with blacksmith and paint shops, repair and stock departments and a thoroughly modern machine shop. It will be ready for occupancy December 1.

BY WAY OF CORRECTION—In the issue of August 21 of THE AUTOMOBILE, an error was made when in the description of the Abbott-Detroit car, page 340, it was said that the motor had a piston dimension of 4.125 by 4.25, which should have been 4.125 by 5.25. Also on page 338, second paragraph, it was said that the Fraver wire wheels were standard on the roadster. This was an error, no decision having been made as to any particular make being used as standard equipment.

AUTOMOBILE 6½ FEET LONG—What is claimed to be the smallest automobile capable of service on the roads has been constructed by D. D. Churchill, of Spokane, and proved effective in city and country travel. The machine is less than 6½ feet long, and was built at a cost of under $250. The highest part of the body of the car is only three feet from the ground. The machine is run by a 20-horsepower engine, and with four passengers has attained a speed of 25 miles an hour.

FORD FOR FIRE FIGHTING—The automobile has come into service as an important agent in fire protective work in California. The United States Forest Service has recently purchased a Ford roadster, to be used in patrolling the line of the San Joaquin & Eastern Railroad, which traverses a large portion of the fire danger zone within the Sierra National Forest south of the San Joaquin River. On this car the ordinary rubber-tired wheels were removed and have been replaced by flanged iron wheels, so that the car is used exclusively on the railroad.

IDEAL STEEL WHEEL IN MONTREAL—The Ideal Steel Wheel Co., Philadelphia, Pa., it is said, will shortly establish an agency in Montreal, Que.

FORD PURCHASES MONTREAL PROPERTY—The Ford Motor Co. has purchased the property at the corner of Laurier and De Gaspe avenues, Montreal, Que., for $72,708, there being 32,315 feet. The company intends to erect a four-story building on the corner.

SANDERS GETS PROMOTION—E. N. Sanders, formerly manager of the Moon M. C. Co., East Moline, Ill., has been promoted to western sales manager of that company, having complete jurisdiction over the sales in the state lying west of the Rocky Mountains.

TENNANT CO. WILL MOVE—The Tennant Motor Co., Ltd., Chicago, Ill., has been appointed agent for the National Motor Vehicle Co., Indianapolis, Ind. J. G. Tennant, treasurer of the company, is the active controlling factor in that organization since W. G. Tennant retired to become vice-president of the Stewart-Warner Speedometer Corp. This company intends building during the winter in order to have larger quarters to take care of the spring business.

MOON CHICAGO BRANCH MOVES—The Moon M. C. Co., Chicago, Ill., has moved from its former salesrooms at 3728 Michigan avenue to 2612 Michigan avenue. The new building has more than 20,000 feet of floor space. The ground floor front is, of course, devoted to the salesrooms. The rear of the first floor is occupied by a completely equipped garage and service station. The second floor front has been converted into a showroom for used cars. The rear of the second floor is utilized for a storeroom for new cars.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

ATLANTIC CITY, N. J.—Parkway Co.; capital, $100,000; to deal in automobiles. Incorporators: W. Lewis, R. L. Beyer, J. H. Hayes.

AYER, MASS.—E. O. Proctor Co.; capital, $50,000; to operate a garage and salesroom. Incorporator: E. O. Proctor.

BROOKLYN, N. Y.—Bushwick Automobile Co.; capital, $2,000; to deal in automobiles. Incorporators: David Werchen, Isaac Rosenberg, Sophie Rosenberg.

BROOKLYN, N. Y.—Williams Auto Service Co.; capital, $2,500; to deal in automobiles. Incorporators: L. C. Saglona, A. S. Williams, A. E. Williams.

CAMDEN, N. J.—Rowe Truck Sales & Service Co.; capital, $100,000. Incorporators: C. P. Steelman, H. W. Severns, J. C. Hoffman.

CHARLOTTE, N. C.—Haynes Motor Sales Co.; capital, $25,000; to deal in automobiles. Incorporators: W. J. Crowell, J. A. Rose, C. H. Garman.

CLEVELAND, O.—Rauch Lang Electric Car Co.; capital, $10,000; to manufacture and deal in electric cars and automobiles. Incorporators: W. H. Marlatt, C. F. L. Wolter, Jr., E. J. Stahl, Norton McGriffin, F. W. Treadway.

DETROIT, MICH.—Metal Parts Engineering Co.; capital, $25,000; to manufacture automobile parts. Incorporators: W. L. Kenfield, W. W. McIntyre.

ELM GROVE, W. VA.—Elm Grove Motor Sales Co.; capital, $10,000; to deal in automobiles.

FORT WORTH, TEX.—Hondo Auto Sales Co.; capital, $2,000; to deal in automobiles. Incorporators: John Scharbauer, B. P. Brummett, C. C. Willingham.

INDIANAPOLIS, IND.—Herff-Brooks Corp.; capital, $100,000; to deal in automobiles. Incorporators: Jackob, Berbert and George Herff, H. H. Brooks, R. Samuels.

INDIANAPOLIS, IND.—Peterson-Keyes Auto Co.; capital, $10,000; to deal in automobiles. Incorporators: W. B. Peterson, P. H. Keyes, A. A. Peterson.

LOS ANGELES, CAL.—Los Angeles Cycle Car Co.; capital, $150,000; to manufacture cyclecars. Incorporator: L. E. French.

LYNBROOK, N. Y.—Metropolitan Motors Corp.; capital, $50,000; to deal in automobiles. Incorporators: R. D. McKay, J. F. Wiggin, S. H. Mills.

MOLINE, ILL.—F. A. Woods, Inc.; capital, $12,000; to deal in automobiles. Incorporators: F. A. Woods, J. F. Carey, W. M. Carr, T. J. Fell.

NEWARK, N. J.—C. F. Briggs Co.; capital, $35,000; to operate a garage and automobile salesroom. Incorporators: C. F. Briggs, A. J. Mousely, A. H. Townsend.

NEW YORK CITY—Liverana-Lombardi Motor Co.; capital, $20,000; to deal in automobiles. Incorporators: A. P. Marr, Joseph Liverana, Francesco Lombardi.

PHILADELPHIA, PA.—F. B. Stearns Co.; capital, $25,000; to deal in automobiles.

PITTSBURG, PA.—Averman & Lynn, Inc.; capital, $5,000; to deal in automobiles. Incorporators: J. Earl Lynn, W. H. Averman, H. I. Miller.

RICHMOND, VA.—Henrico Car Co.; capital, $50,000; to manufacture automobiles. Incorporators: A. C. Nelsen, J. A. Reams, George Preston.

ROCHESTER, N. Y.—Rochester Motors Co., Inc.; capital, $300,000; to manufacture motors. Incorporators: E. F. Davidson, E. H. Gruelle, E. H. Stearns.

ST. LOUIS, MO.—Anselm-Ganahl M. C. Co.; capital, $5,000; to deal in automobiles. Incorporators: R. W. Anselm, L. F. Ganahl, R. J. Ganahl.

ST. LOUIS, MO.—Palmer-Meyer M. C. Co.; capital, $100,000; to deal in motor trucks. Incorporators: F. A. Meiser, F. C. Meyer.

UTICA, N. Y.—Wahl Auto Sales Co.; capital, $2,000; to deal in automobiles. Incorporators: M. F. Robischon, E. R. Robischon, J. J. Lanz.

WASHINGTON, D. C.—Probey-Haynes Motor Co.; capital, $10,000; to deal in automobiles. Incorporators: T. C. Probey, W. D. Arrison.

WEST END, N. C.—Alta Motor Car Co.; capital, $10,000; to deal in automobiles. Incorporators: H. A. Page, Frank Page.

WILMINGTON, DEL.—Auto & Tire Sales Co.; capital, $100,000; to deal in automobiles and accessories. Incorporators: E. D. Buck, G. W. Dillman, B. M. Grawl.

WILMINGTON, DEL.—Kearns Motor Truck Co.; capital, $100,000; to deal in motor trucks. Incorporators: G. G. Stiegler, H. E. Grubb, W. M. Pyle.

WILMINGTON, O.—Wilmington Auto Co.; capital, $10,000; to deal in new and second-hand automobiles. Incorporators: C. S. Bangham, F. L. Gallup, W. H. Hoskins, W. J. Lewis, Harry McKay, E. T. McPherson, C. D. Pidgeon.

YOAKUM, TEX.—Universal Motor Car & Supply Co.; capital, $3,000; to deal in automobiles. Incorporators: Otto Wagener, F. F. Klohs, H. S. Eekam.

GARAGES AND ACCESSORIES

BROOKLYN, N. Y.—Flatbush Avenue Taxicab Co.; capital, $5,000; to operate a taxicab service and garage. Incorporators: Charles Stork, John Wilmartin, William H. Fangemann.

BROOKLYN, N. Y.—Killmer Co.; capital, $10,000; to manufacture Gilson primers and gasoline savers. Incorporators: R. H. Killmer, N. A. Killmer.

BUFFALO, N. Y.—Clifford Co.; capital, $15,000; to manufacture equipment for automobiles and motor boats. Incorporators: W. M. Sellec, Clarence Clifford, Welford Golden.

CHARLESTON, S. C.—Charleston Auto Rental Co.; to deal in and rent automobiles. Incorporators: Edmund Jahnz, Hugo Jahnz.

EAST PALESTINE, O.—National Tire & Rubber Co.; capital, $150,000; to manufacture all kinds of rubber goods. Incorporators: C. J. Davis, R. F. Taggert, William Smith, A. E. Albright, John Kennedy Ewing, Jr.

KINGS, N. Y.—United States Garages, Inc.; capital, $500; to carry on a general garage business. Incorporators: J. H. Herman, Jr., Rose Simon.

LOUISVILLE, KY.—Helical Shock Absorber Co.; capital, $120,000; to manufacture and sell motor shock absorbers and other automobile and motor appliances.

NEW YORK CITY—Arrowsmith Mfg. Co.; capital, $10,000; to manufacture automobile accessories. Incorporators: Frederick Kalmbach, Albert Kalmbach, J. M. Flick.

NEW YORK CITY—Francis Motor Renting Co.; capital, $10,000; to rent automobiles. Incorporators: R. H. Elder, H. B. Inch, R. B. Inch.

NEW YORK CITY—Jesco Equipment Co.; capital, $12,000; to deal in accessories. Incorporators: F. D. Boulanger, Alfred Ware, G. W. Wacker.

NEW YORK CITY—Sireno Co.; capital, $5,000; to manufacture automobile horns. Incorporators: G. H. Tamlyn, C. F. Pearce, W. H. Pearce.

PITTSBURG, PA.—Mutual Taxicab Co.; capital, $10,000; to conduct a taxicab service. Incorporators: Antonio Flocker, C. E. Meyer, M. J. Dain.

RICHMOND, VA.—Automobile Cover & Supply Co.; capital, $15,000; to deal in accessories. Incorporators: A. Blackburn, A. W. Evans, H. B. Williamson.

RICHMOND, N. Y.—Commercial Body Co.; capital, $12,000; to manufacture automobile bodies. Incorporators: Wm. Hertz, Caspar A. Scheiper, A. W. Owen.

SAN ANTONIO, TEX.—Auto Owners' Protective Co.; capital, $10,000; association to protect autoists from theft. Incorporators: H. W. G. Jago, J. T. Jamison.

TOLEDO, O.—Griffin Taxicab Co.; capital, $10,000; to do a general taxicab business. Incorporators: S. B. Coss, C. C. Sampson, C. E. Thompson, J. H. O'Leary, G. E. Coss.

WASHINGTON, D. C.—Water Jacket Heater Co.; capital, $300,000; to manufacture automobile parts and accessories. Incorporators: C. J. Comstock, H. F. Shepard, M. E. Brown.

WILMINGTON, DEL.—Blodgett Rubber Co.; capital, $150,000; to deal in tires. Incorporators: H. E. Latter, N. P. Coffin, O. J. Reichard.

CHANGES OF NAME AND CAPITAL

DALLAS, TEX.—Stafford Illuminated Auto Lamp and Number Co.; change of name to the Stafford Auto Lamp and Number Co.

DETROIT, MICH.—American Cycle Car Co.; capital increased from $1,000 to $200,000.

INDIANAPOLIS, IND.—Capital Body Co.; capital increased from $10,000 to $30,000.

New Agencies Established During the Week

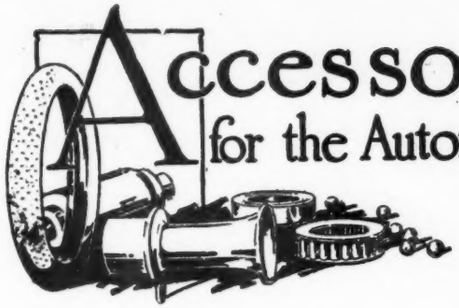
PASSENGER VEHICLES

Place	Car	Agent
Chicago, Ill.	National	Tennant Motor Ltd.
Columbus, O.	Fiat	Ira Madden
Columbus, O.	Herreshoff	Johnston Sales Co.
Columbus, O.	Jackson	Litner Garage & Machine Co.
Columbus, O.	Lozier	Gwinn Sales Co.
Columbus, O.	Mitchell	C. E. Thomas Co.
Columbus, O.	Paige-Detroit	Central Auto Veh. Co.
Columbus, O.	Pierce-Arrow	Broad-Oak Auto Co.
Columbus, O.	R-C-H	Johnston Sales Co.
Columbus, O.	Reo	Broad-Oak Auto Co.
Columbus, O.	Richmond	Jacob Renner
Columbus, O.	Winton	E. J. Thornton
Coshocton, O.	Overland	C. W. Loos & Sons
Davenport, Ia.	Overland	W. E. Priester
Des Moines, Ia.	Lozier	Payne Motor Co.
Des Moines, Ia.	Norwalk	Taylor Garage Co.
Des Moines, Ia.	Paige	Payne Motor Co.
Hartford, Conn.	Velie	J. N. Macdonald Co.
Hartford, Conn.	Velie	R. D. Britton
Hutchinson, Kan.	Studebaker	Ellis & Wesgarber
Logan, O.	Chalmers	Theodore Johnson
Logan, O.	Hudson	Cage Automobile Co.
Marshall, Mo.	Cole	Blosser Bros.
Milwaukee, Wis.	Marion	J. A. Smith Auto Co.
Milwaukee, Wis.	Speedwell	G. L. Stephenson
Minneapolis, Minn.	Empire	A. F. Chase & Co.
Minneapolis, Minn.	Herreshoff	White Garage
Minneapolis, Minn.	Partin-Palmer	Regal Sales Co.
Minneapolis, Minn.	Pope-Hartford	Satterlee-Fosness Co.
Minneapolis, Minn.	Marion	A. F. Chase & Co.
Minneapolis, Minn.	Monarch	Stimson Auto Co.
Oran, Mo.	Cole	C. & A. J. Mathews
Springfield, Mass.	Hudson	E. V. Stratton Co.
St. Louis, Mo.	Auburn	Grand M. C. Co.
St. Louis, Mo.	Ford	Grand-St. Louis Auto Co.
St. Louis, Mo.	Maxwell	Maxwell Motor Sales Co.
Tiffin, O.	Maxwell	R. W. Glick
Tolland, Conn.	Hudson	G. D. Knox
Tucson, Ariz.	Overland	J. H. Huntsman
Windham, Conn.	Chalmers	F. L. Caulkins & Co.
Worcester, Mass.	Velie	Eaton-Brewster Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Boston, Mass.	Willys Utility	R. & L. Co.
Detroit, Mich.	Speedwell	Kratz & Kratz
Los Angeles, Cal.	Kregs	Motor Car Distributors Co.
Minneapolis, Minn.	Menomonie	Armstrong Transfer Co.
Pittsburg, Pa.	Commerce	Klingar Auto Co.
Racine, Wis.	Commerce	W. R. Taylor Motor Co.
Springfield, Mass.	Stewart	E. V. Stratton Co.
Waco, Tex.	Commerce	Cartercar Sales Co.
Waterloo, Ia.	Dart	Pennsylvania Dart Branch
Worcester, Mass.	Velie	Eaton-Brewster Co.

Accessories for the Automobilist



HOT Sparks Claimed for Triplex Plug—The Triplex plug is made by the Chas. R. Bates Co., 35 Warren street, New York City, and is radically new in many details of construction and design. While the patent claims recite some twenty-eight different points, the most important of these is the use of three distinct spark gaps through which the electric current must flow, jumping from point to point in its passage, instead of the one gap universally used. Fig. 1. The maker claims that three very hot sparks are thus obtained at the same time. In the Triplex plug the central electrode carrying the current is made of Meteor wire. In molding it into the porcelain it is diverted at the firing end one-quarter off center. That is, if the face of the porcelain were 1 inch across, it would emerge .25 inch from the edge or shell. Separated from it by the usual .03⅛-inch gap is a T-head pin also of Meteor metal, and then separated by another gap is a second pin. These are anchored by being set in the porcelain farther around the circumference also .25 inch from the edge on opposite sides and are bent at right angles so that the T-heads or square ends with the gaps form a straight line across the end of the porcelain to the contact pin, which is set in the shell on the other side. As will be seen from the end view sketch, Fig. 1, the current coming down the central electrode jumps gap 1 to a T-head conductor A, which is insulated in the porcelain, flows through it to the other side and jumps gap 2 to insulated T-head B, flows through it to gap 3, and jumps it to outside shell pin and returns to ground. The whole is an instantaneous flash flow across the plug face or end, with three sparks or flashes at the same time and at three different places instead of one. The porcelain extends a short distance beyond the steel shell into the firing chamber. It is rigid to the seat on the usual asbestos and copper gasket and the shell is ventilated with a series of holes drilled in each flat hexagonal surface of the shell to radiate the heat and keep it cool. The maker claims that it keeps the plug clean, as all carbon deposit is immediately burned off the end of the plug.

Fig. 1—Triplex spark-plug

Standard Automobile Jacks—The Cook's Standard Tool Co., Kalamazoo, Mich., is this year bringing out five jacks. The No. 1 Standard, which is shown in Fig. 2, at the left, is single acting; that is, lifting the car and lowering on the downward stroke only. It has a lifting capacity of 2,000 pounds. For extra large wheels this jack can be furnished with a height of 13.5 inches down and 20 inches raised. The No. 3 Standard, shown in the same cut, in the center, is on the same style of the No. 1 Standard, but can be used to advantage in lifting a car out of a hole where another jack would be too high. The top of this jack is shaped to reach in over truss rods and grapple the axle. This has a height bar down of 8.5 and 11.5 inches, and a height bar raised to 15 and 18 inches. The lifting capacity is 2,000 pounds. Another type made by this firm is the Kazoo, a quick-acting screw jack, at the right, which operates on the principle of bevel gear. The horizontally placed bevel wheel on the top of the standard is threaded inside to fit the screw portion of the lifter and the bevel teeth on this part engage directly with the larger bevel wheel formed integrally with the lever. A reversible pawl rests on top of the second bevel wheel so that the latter moves only in one direction on operating the handle. Reverse is made by simply throwing over this pawl. The screw on the lifter is a machine-cut square thread of quick pitch.

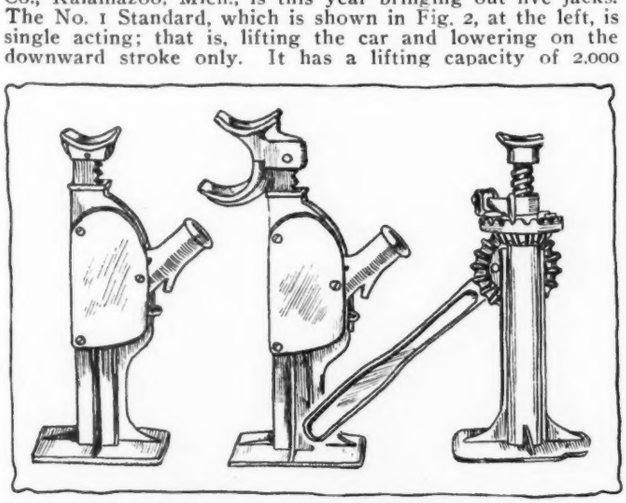


Fig. 2—Three types of Standard automobile jacks

Shumaker Aqueous Vapor Combustion Device—This apparatus is designed to provide at all times that increase of power due to better combustion that is generally held to take place in the running of gasoline motors on a damp evening or when the humidity of the atmosphere is high. An outline of the system as applied to a motor is shown in Fig. 3. It consists of a copper tank saddled on the exhaust pipe and a small pipe taken from the top of this tank to the intake manifold at a point just above the carbureter connection. At the attachment of this pipe to the tank is a regulating valve, the handle of which projects through the dash at a convenient point. It is thus an easy matter to regular the amount of vapor drawn into the cylinder with the gas. The air supply to the mixture is also regulated from the driver's seat. The water consumption is about 1 quart to every 20 to 25 miles on a 50-horsepower motor.

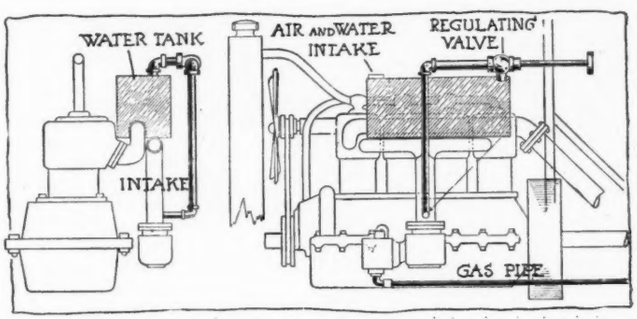


Fig. 3—Diagram illustrating the application and operation of the Schumaker aqueous vapor combustion device

A further great advantage claimed for the device is that of effecting a material reduction of the carbon deposit nuisance.

The Shumaker combustion device is manufactured by the J. T. Shumaker Motor Car Co., 361 Pacific street, Rochester, N. Y.

Nelson Special Tire Valve Tools—A line of special tools for tire valves is manufactured by the A. Nelson Mfg. Co., 564-572 West Randolph street, Chicago, Ill. The "Three-in-One" tool is made in two styles, A and B, Fig. 4, both combining a die for re-cutting the thread on the stem, a tap for correcting the thread of the cap and a device for removing the valve from the stem. The "Four-in-One" tool

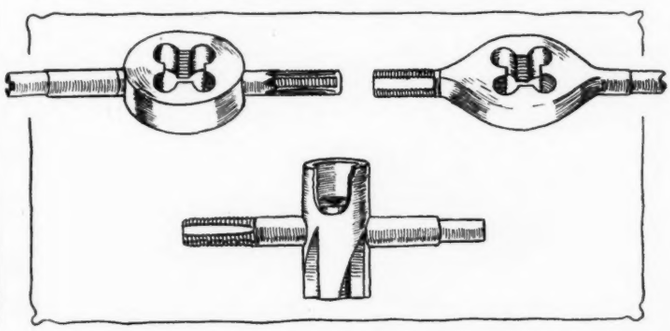


Fig. 4—Nelson die, tap and wrench combination tire valve tools

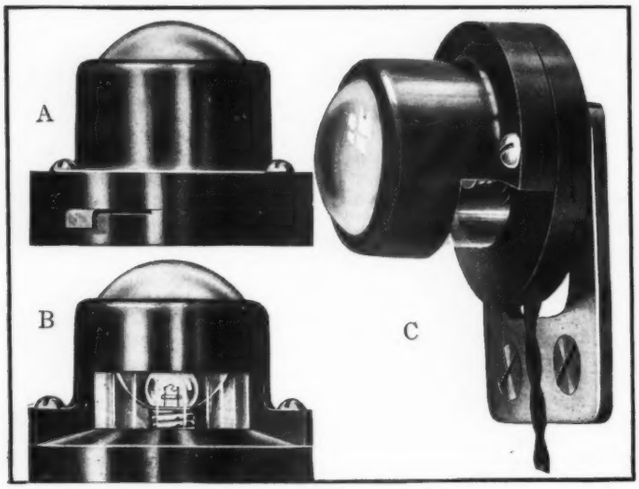


Fig. 5—The three new J-M Mobilite electric lamps

is similar in purpose to the "Three-in-One" type, but is much superior in that it has four cutting lips and a facing cutter with which rough surfaces may be removed from the top of the valve. The maker claims that the grade of material, workmanship and finish used in the manufacture of these tools is of the highest order.

Johns-Manville Electric Lamp—The H. W. Johns-Manville Co., New York City, recently put on the market three new electric lamps, Fig. 5, for automobiles, motor boats, motorcycles, garages, bungalows, etc. These lamps are operated by dry batteries and are known as the J-M Mobilite. They consist of vulcanized rubber sockets fitted with powerful lenses and reflectors. The source of light is a specially-made tungsten bulb which throws a pure white light of unusual brilliance that can be seen for a long distance. Although these lamps are intended to operate on dry batteries, storage batteries or low-tension magnetos may be used if desired. The manufacturers claim that these new electric lamps stay lighted during the entire life of the electric bulb as long as there is sufficient battery power to supply current, and in case a lamp suddenly goes dark, the chauffeur is instantly made aware of the fact by the tell-tale lamp on the inside of the dashboard, which also illuminates the speedometer. Unlike metal lamps, these lamps have no complicated parts to catch the dust and dirt, hence they are readily cleaned. A complete equipment consists of two front lamps, type A, set in the dashboard, an inside dashboard lamp, and a tail lamp, B. The tail lamp throws a colored light directly back of the machine. A white light is thrown on the license number through a slot in the bottom of the lamp. This lamp has an ingenious concealed key-switch, thereby conforming to the law of several states requiring the tail light to be controlled from the rear of the car. As this switch is concealed it cannot be tampered with. A portable lamp, C, not included in the regular equipment, is illustrated on the right of the illustration. This lamp is the same type as B, except that it has 15 feet of cord and a strong metal clip for attaching to projections. It is very handy for making inspections at night when mechanical or tire troubles develop and also serves to light the tonneau. It is claimed that a set of four lamps will run intermittently on six No. 6 dry batteries for 80 to 120 hours, and on six No. 8 batteries for 300 to 420 hours.

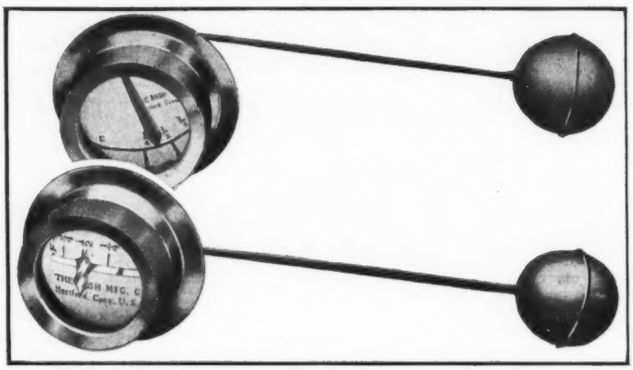


Fig. 6—Two types of Bush gasoline gauges. The upper is designed for use on the side of the tank, while the lower is adapted for the top of the receptacle

Bush Gasoline Gauge—The Bush Mfg. Co., Hartford, Conn., manufactures two gauges for gasoline tanks. In the upper part of Fig. 6 is shown one gauge which is made to be used on the side of the tank. The metal bulb, which is airtight, shown at the right of the illustration, is placed inside the tank, and then by its buoyancy is moved up or down according to the amount of gasoline contained in the tank. This bulb is attached to a lever, which in turn moves an indicator on a dial from the left of the gauge to the right. When empty the bulb is down and the dial at E. The gauge is divided into quarters. The lower part of the illustration shows a gauge to be used on the top of a tank. The same action is produced in the indicator by the buoyancy of the bulb, as in the first described. A similar graduated scale is given, but the indicator moves horizontally on the dial according to the position which is occupied by the bulb in the tank.

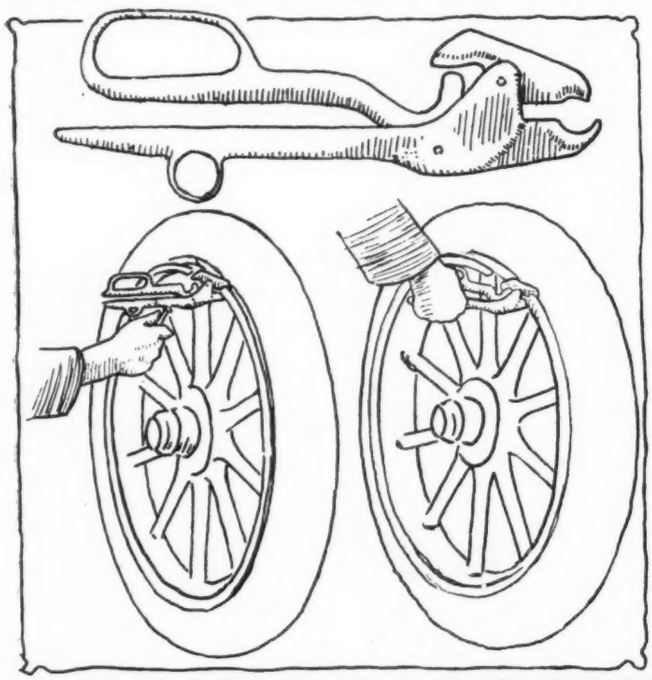


Fig. 7—L. & M. Q. D. tire ring remover, and method of operation

L. & M. Q. D. Tire Ring Remover—The Adam A. Long Machine Works, Rochester, N. Y., manufactures the L. & M. Q. D. ring remover and replacer for tires. The illustration on the right, Fig. 7, shows the tool locked to the rim ready for removing the ring. By starting the tool in a downward position, pulling it upward over the locking ring and against the inner ring, at the same time pressing it together over the locking ring and against the inner ring, it will force the inner ring away from the locking ring. In this position the tool will become automatically clamped to the ring, thus leaving the operator free to use both hands to remove the ring with an ordinary screw-driver. The illustration on the left shows the tool locked to the rim. The tool is provided with a retaining block, the purpose of which is that it be placed within the rim groove to provide something to which to clamp the tool when the ring is not in place. This is the first thing to be done in order to force the inner ring over to make room for the locking ring which is then placed in position. When this is done the tool is removed from the retaining block and the ring is pinched into position by starting 4 or 5 inches from the end, and then, holding it in this position with a screw-driver, the tool is removed and moved along a few inches, the operation being repeated until the entire ring is in place.

E-Z Polishing Cloth—A cloth ready for cleaning and polishing brass, copper and steel is being marketed by Ralph Waldt, 1682 Broadway, New York City. This cloth alone does the work. It contains no acid, according to the maker. The luster after polishing will last a long time, as an imperceptible covering of oil is left, which turns away the drops of rain.